

Classification de Bosniak

Mode d'emploi - Limites et CAT

O Hélénon, S Merran et coll

- **Situation fréquemment rencontrée**

Kystes: 50% après 50 ans

CCR kystiques: 10%

Découverte fortuite sur scanner/IRM abdominale

- **L'outil : système de Bosniak (1986 - 1997 v2)**

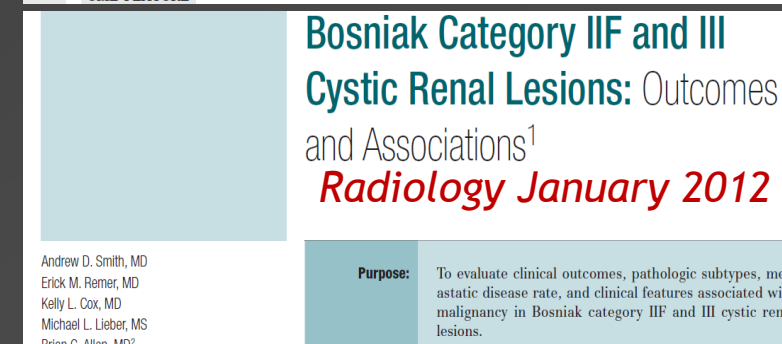
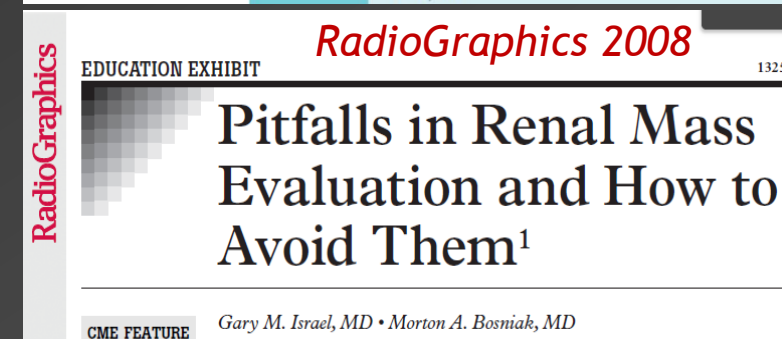
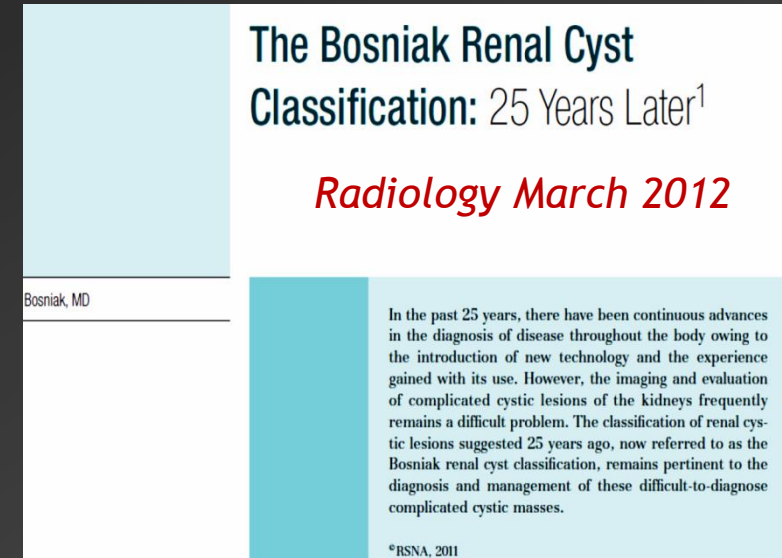
BOSNIAK MA. The current radiologic approach to renal cysts. Radiology 1986

➔ *La classification TDM de Morton Bosniak I, II, III, IV*

BOSNIAK MA. Diagnosis and management of patients with complicated cystic lesions of the kidney. AJR 1997 ➔ Introduction de la catégorie IIF (Follow-up)

- **Les limites de la classification**
Certains critères très subjectifs
Littérature parfois discordante
Variabilité inter-observateurs
Ne résout pas ttes les situations rencontrées:

- ➔ Connaître son champ d'application
- ➔ S'approprier et maîtriser des critères reproductibles
- ➔ Reconnaître les masses inclassables et mal classées



Tumeurs kystiques (cat IIF, III et IV)

- **Carcinome conventionnel (80% CCR)**

Formes kystiques: 25%

Uni ou multiloculaire

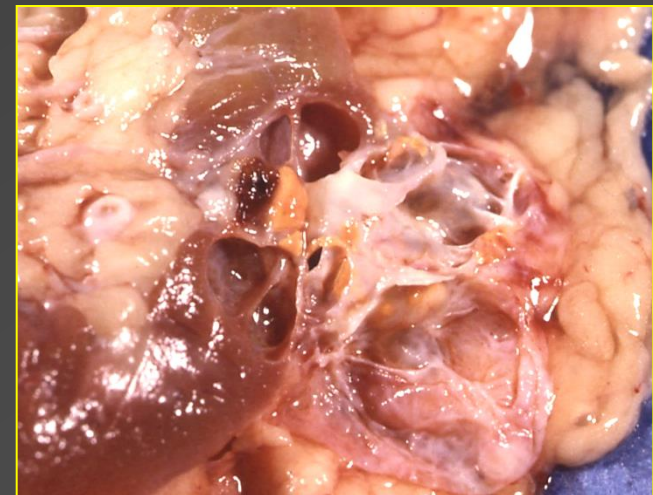
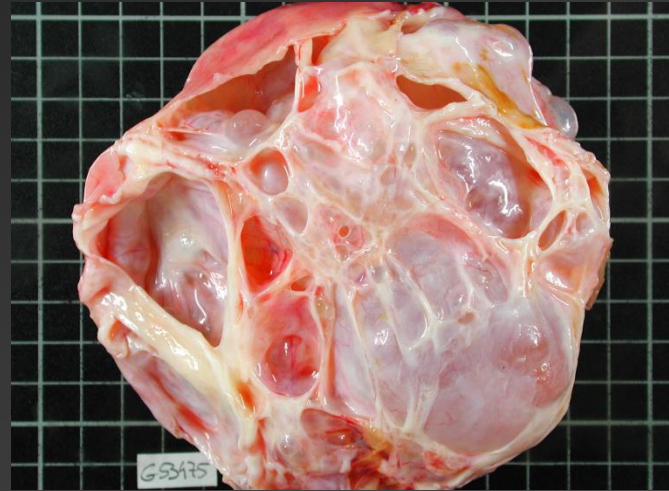
- **Carcinome kystique multiloculaire à c claires**

- **Carcinome papillaire (15% CCR)**

Forme pseudokystiques
unilocul: 30%

- **Néphrome kystique <1%**

Tumeur bénigne multiloculaire
Paroi fibreuse + épith aplati



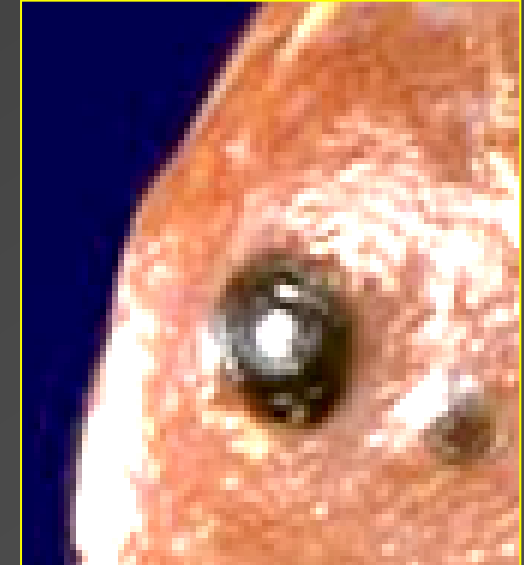
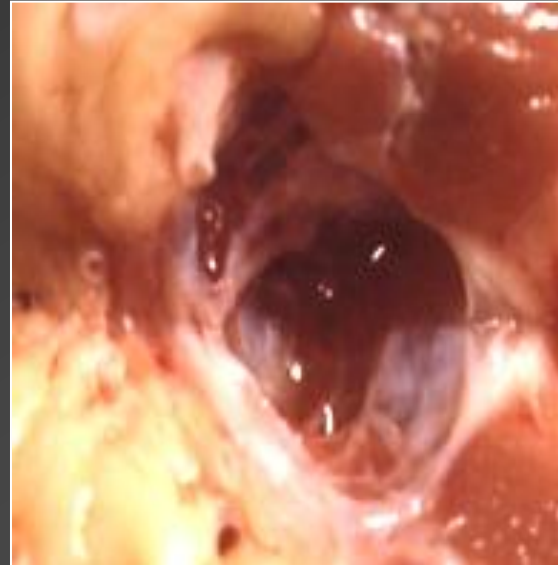
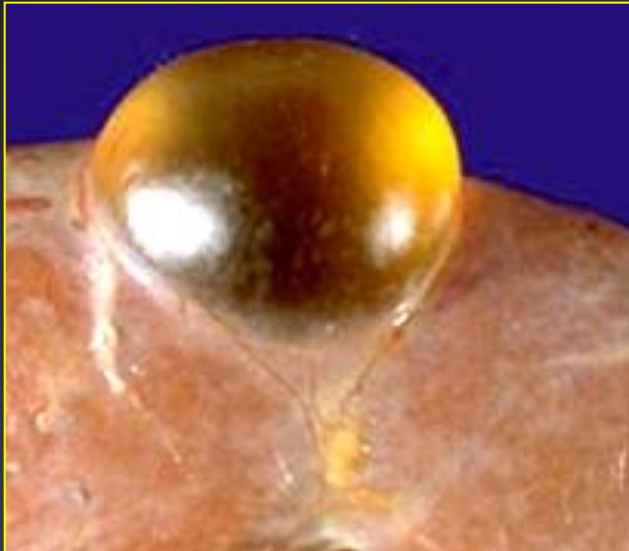
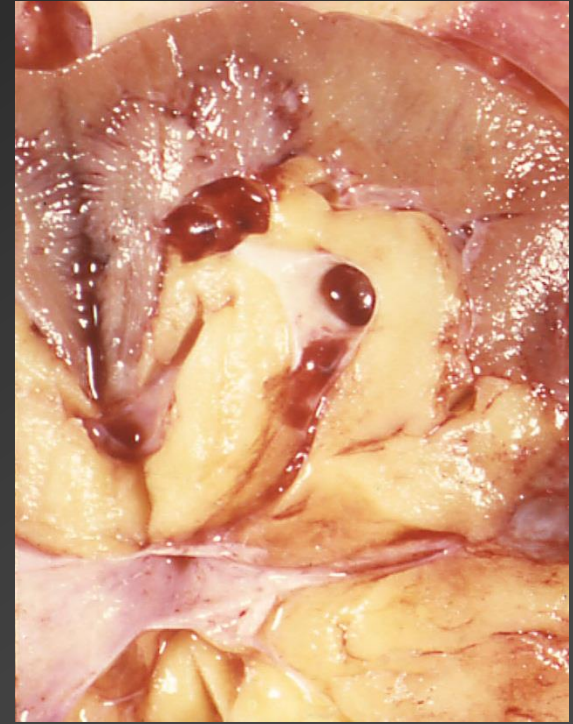
Kystes (Cat I, II, IIF et III)

- **Kyste épithélial (50% >50 ans)**

Simple ou remanié (infection hémorragie)
Cortical ou médullaire

- **Kyste parapyélique**

Lymphangiectasie
Origine parenchymateuse



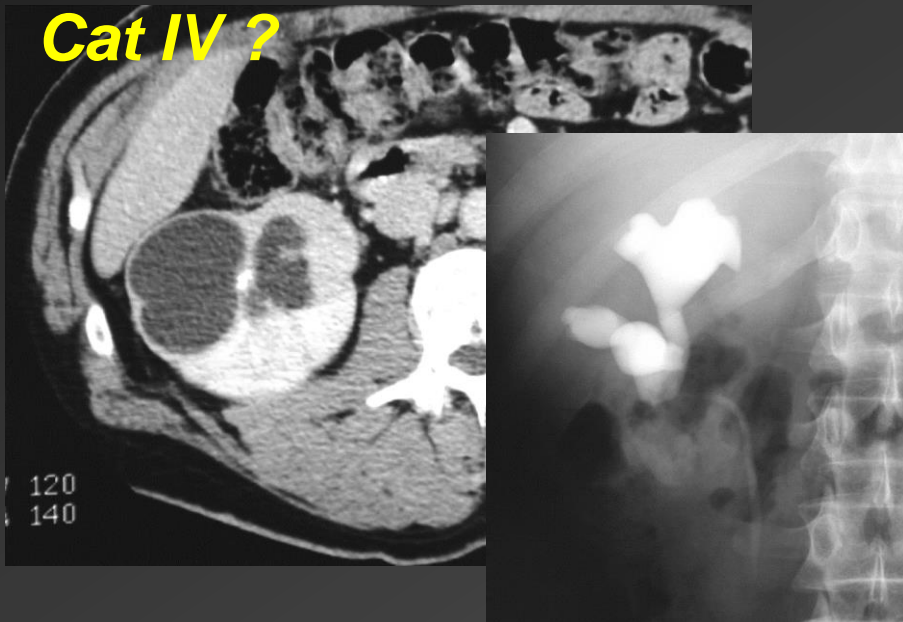
Champ d'application (diag différentiel)

Classification de Bosniak

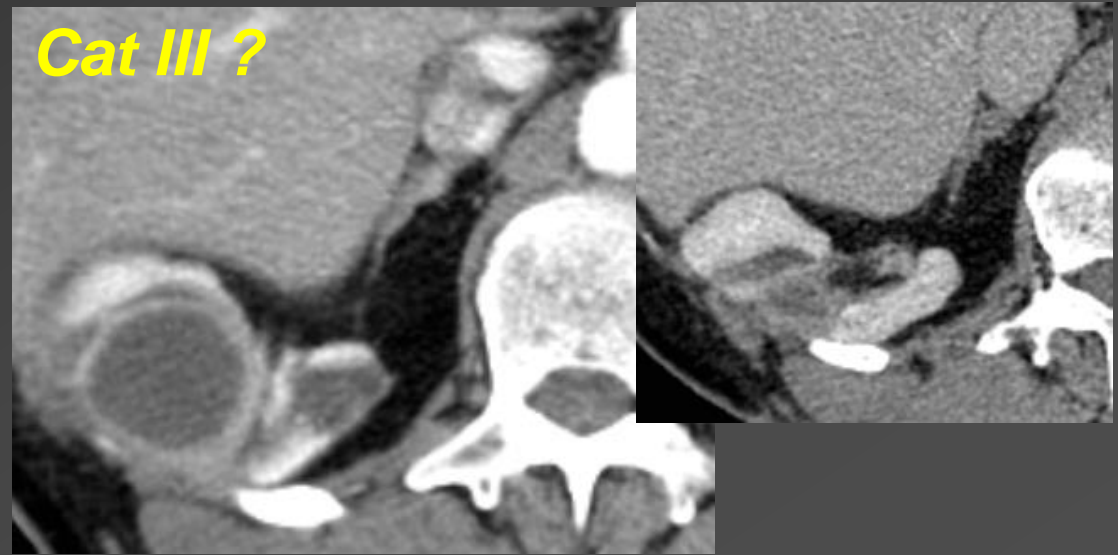
- Masses supracm, origine épithéliale (néphron)
- **En dehors de:**
 - Lésions d'origine urothéliale (diverticule, ...)
 - Origine infectieuse et parasitaire (abcès chronique, ...)
 - Contexte urologique aigu (hémorragie, traumatisme)
 - Dystrophie kystique localisée

➔ Ne pas classer !

Cat IV ?



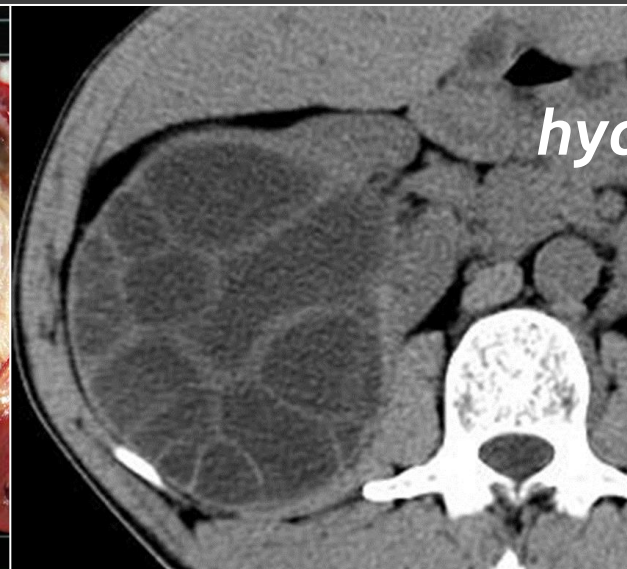
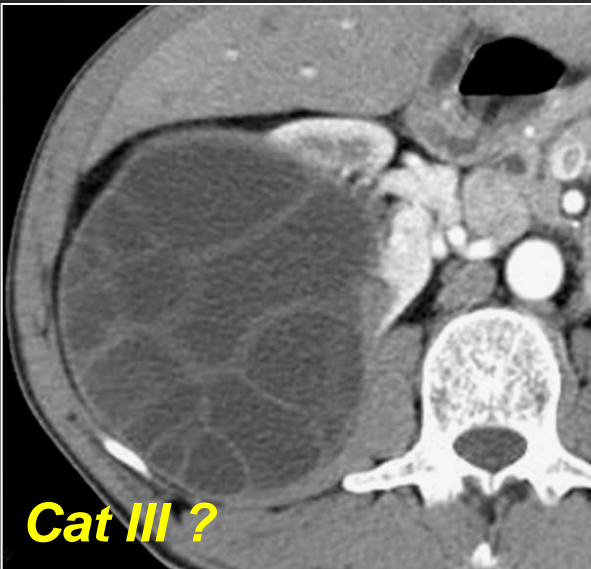
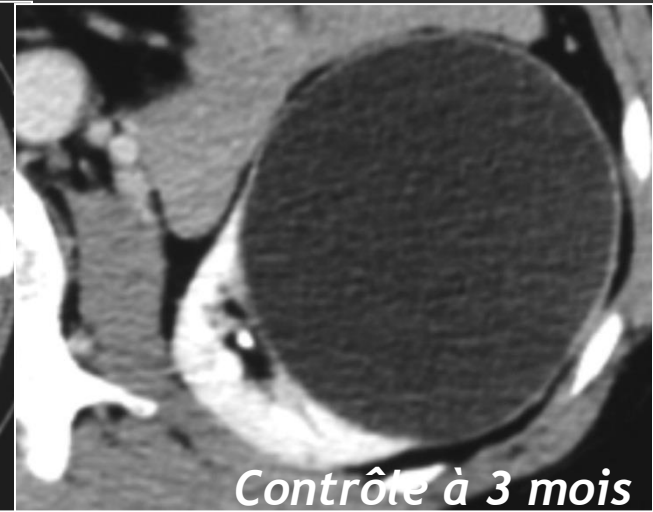
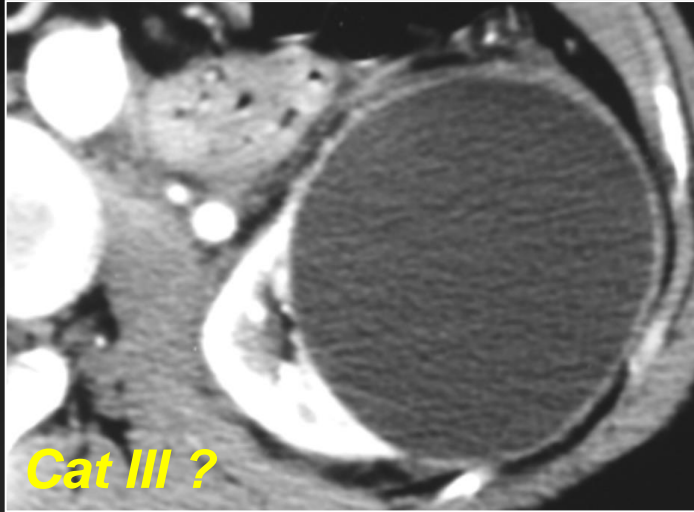
Cat III ?



Champ d'application

*Evènement
hémorragique*

➔ Ne pas classer ! Mais contrôler



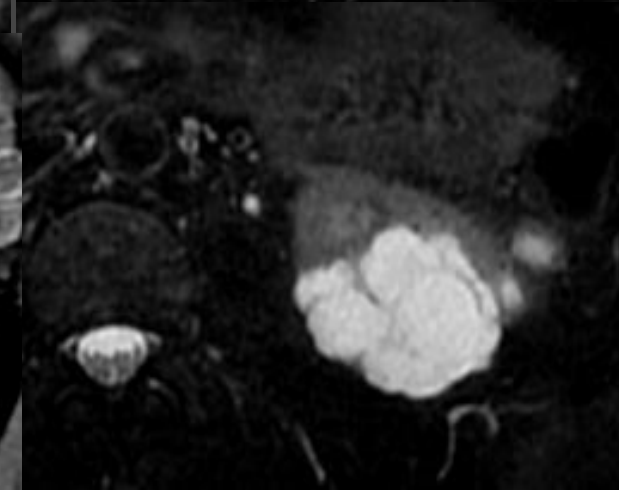
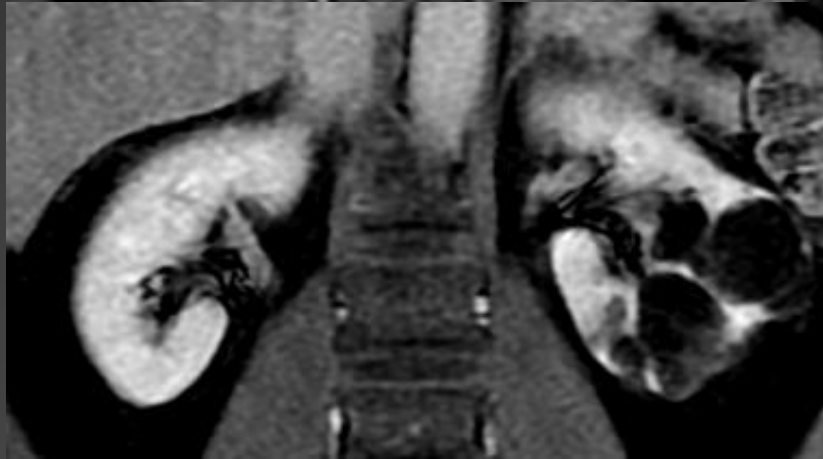
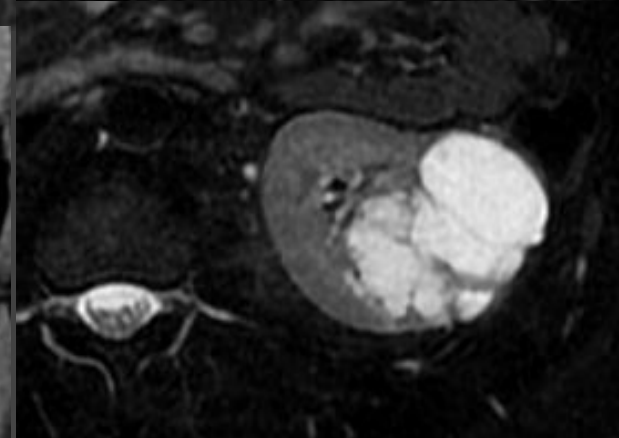
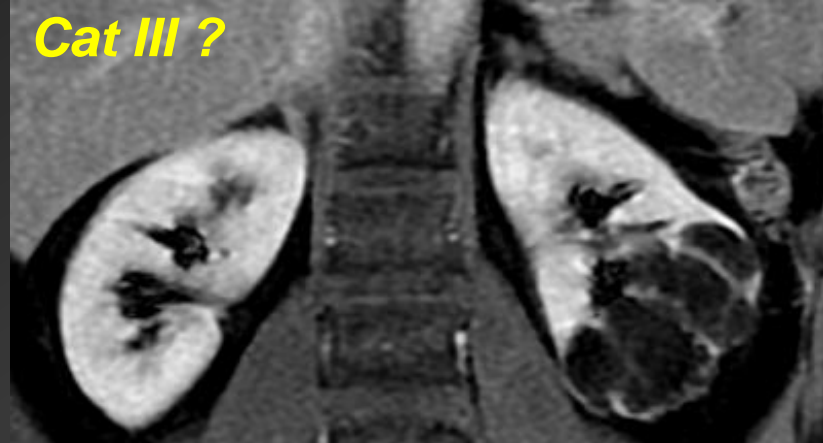
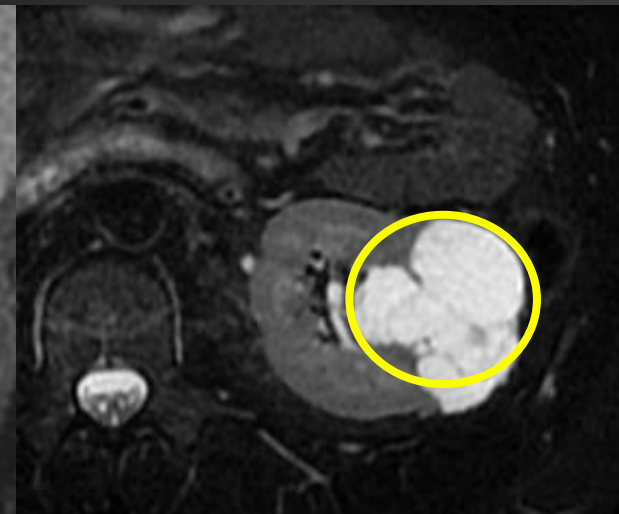
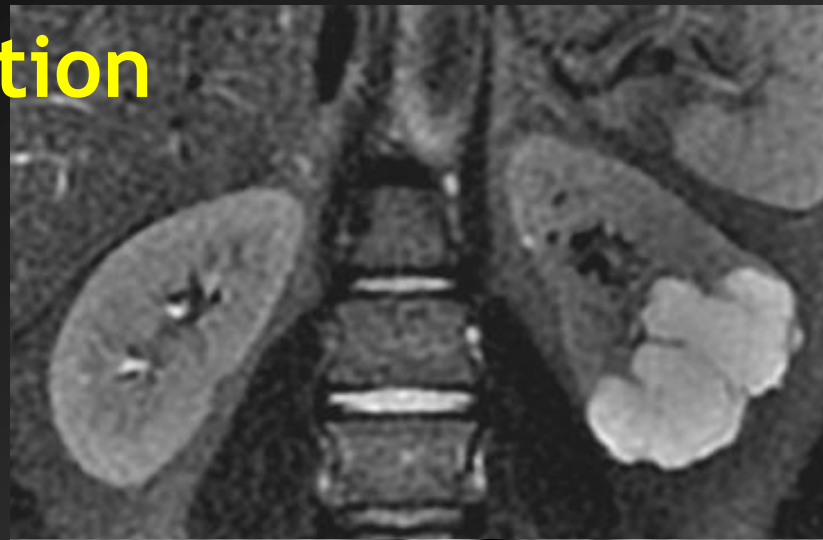
*Kyste
hydatique*

Champ d'application

*Dystrophie
kystique
localisée*

➡ Ne pas classer
Mais surveiller

*Lésion kystique
non encapsulée*



S'approprier et maîtriser des critères reproductibles

Category IIF (the "F" indicates need for follow-up imaging) lesions are more complex cysts that cannot be neatly classified as category II or III lesions. These cysts may contain an increased number of hairline-thin septa or have minimal but smooth thickening of the wall or septa. The wall and/or septa may contain calcifications, which may be thick and nodular, without obvious enhancement. Like category II cysts, these lesions may demonstrate minimal perceived enhancement of a hairline-thin smooth septum or wall; however, there are no enhancing soft-tissue components. Non-enhancing high-attenuation lesions (high-attenuation cysts) that are completely intrarenal and

included in Category IIF. Category IIF masses, and mined at in nign or mal irregular wa enhancement. Category I

Quantifying the thickness of the septa or wall that would place a lesion in category IIF is also not possible. However, any thickness to the septum or wall that is greater than hairline thin would upgrade a lesion from category II to category IIF. In our series, 39 of the 42 lesions contained either a septum or wall that was slightly thicker than hairline thin. It is this slight thickening that requires that these le-

The Bosniak Renal Cyst Classification System

Category	Criteria and Management
I	A benign simple cyst with a <u>hairline-thin wall</u> that does not contain septa, calcifications, or solid components; it has <u>water attenuation</u> and does not enhance; no intervention is needed
II	A benign cystic lesion that may contain a few hairline-thin septa in which perceived (not measurable) enhancement may be appreciated; fine calcification or a short segment of slightly thickened calcification may be present in the wall or septa; uniformly high-attenuating lesions (<3 cm) that are sharply margined and do not enhance are included in this group; no intervention is needed*
IIF [*]	Cysts may contain multiple hairline-thin septa; <u>perceived (not measurable) enhancement</u> of a hairline-thin smooth septum or wall can be identified; there may be minimal thickening of wall or septa, which may contain calcification that may be thick and nodular, but no measurable contrast enhancement is present (45); there are no enhancing soft-tissue components; totally intrarenal nonenhancing high-attenuating renal lesions (>3 cm) are also included in this category; these lesions are generally well margined; they are thought to be benign but need follow-up to prove their benignity by showing stability (46)*
III	Cystic masses with thickened irregular or smooth walls or septa and in which measurable enhancement is present; these masses need surgical intervention in most cases, as neoplasm cannot be excluded; this category includes complicated hemorrhagic or infected cysts, multilocular cystic nephroma, and cystic neoplasms; these lesions need histologic diagnosis, as even gross observation by the urologist at surgery or the pathologist at gross pathologic evaluation is frequently indeterminate
IV	Clearly malignant cystic masses that can have all of the criteria of category III but also contain distinct enhancing soft-tissue components independent of the wall or septa; these masses are clearly malignant and need to be removed

*Perceived enhancement refers to enhancement of hairline-thin or minimally thickened walls or septa that can be visually appreciated when comparing unenhanced and contrast-enhanced CT images side-by-side and on subtracted MR imaging datasets. This "enhancement" occurs in hairline-thin or smooth minimally thickened septa/walls and, therefore, cannot be measured or quantified. The authors believe tiny capillaries supply blood (and contrast material) to these septa/walls, which are appreciated because of higher doses of intravenous contrast material and

ISRAEL GM, BOSNIAK MA. Follow-up CT of moderately complex cystic lesions of the kidney (Bosniak category IIF). AJR 2003

ISRAEL GM, HINDMAN N, BOSNIAK MA. Evaluation of cystic renal masses : comparison of CT and MR imaging by using the Bosniak classification. Radiology 2004

ISRAEL GM, BOSNIAK MA. How I do it ? Evaluating renal masses. Radiology 2005

Outils diagnostiques

■ Les densités et leurs variations

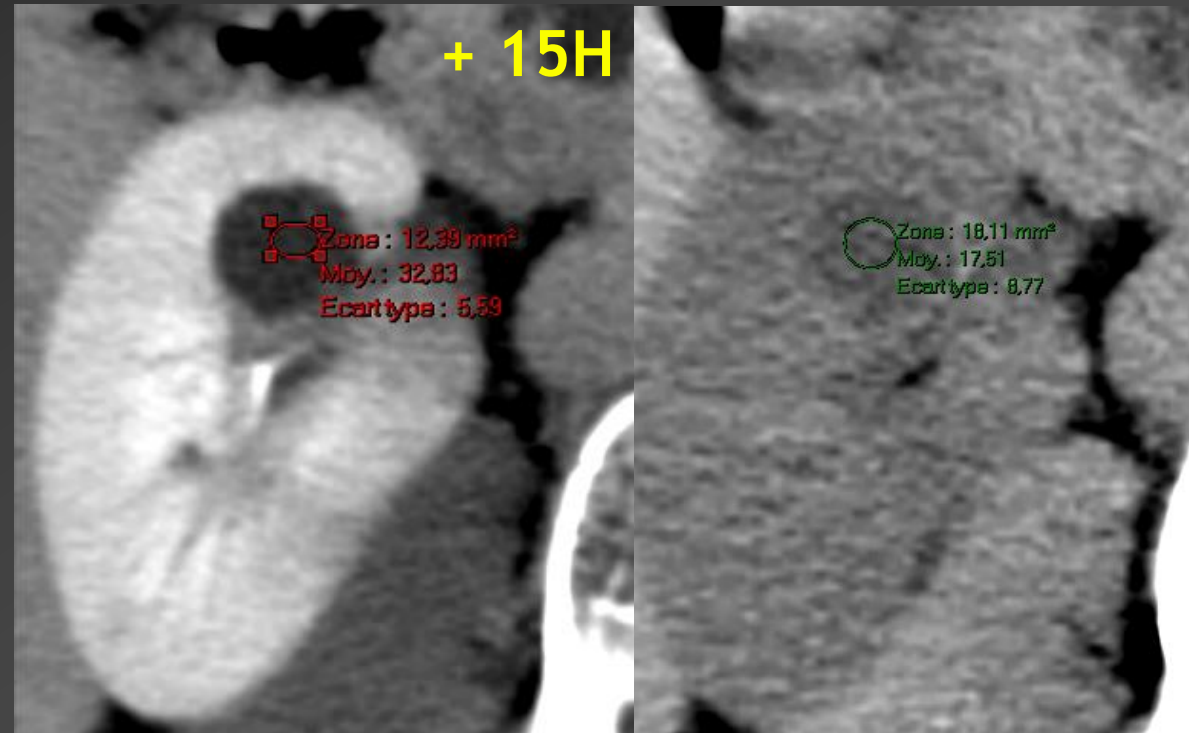
Densité spontanée « hydrique » $< 20\text{H}$ (15H et moins)

Rehaussement:

négatif $\Delta\text{UH} < 10\text{H}$

positif $\Delta\text{UH} > 15\text{H}$
(20H et plus)

indéter. $\Delta\text{UH} 10\text{-}20\text{H}$



Outils diagnostiques

■ La paroi

Normale: inframm

Non visible: interface

Epaisse:

Non mesurable ($\leq 1\text{mm}$)

✓ Mesurable ($>1\text{mm}$)

Régulière et uniforme

Irrégulière, nodulaire,..

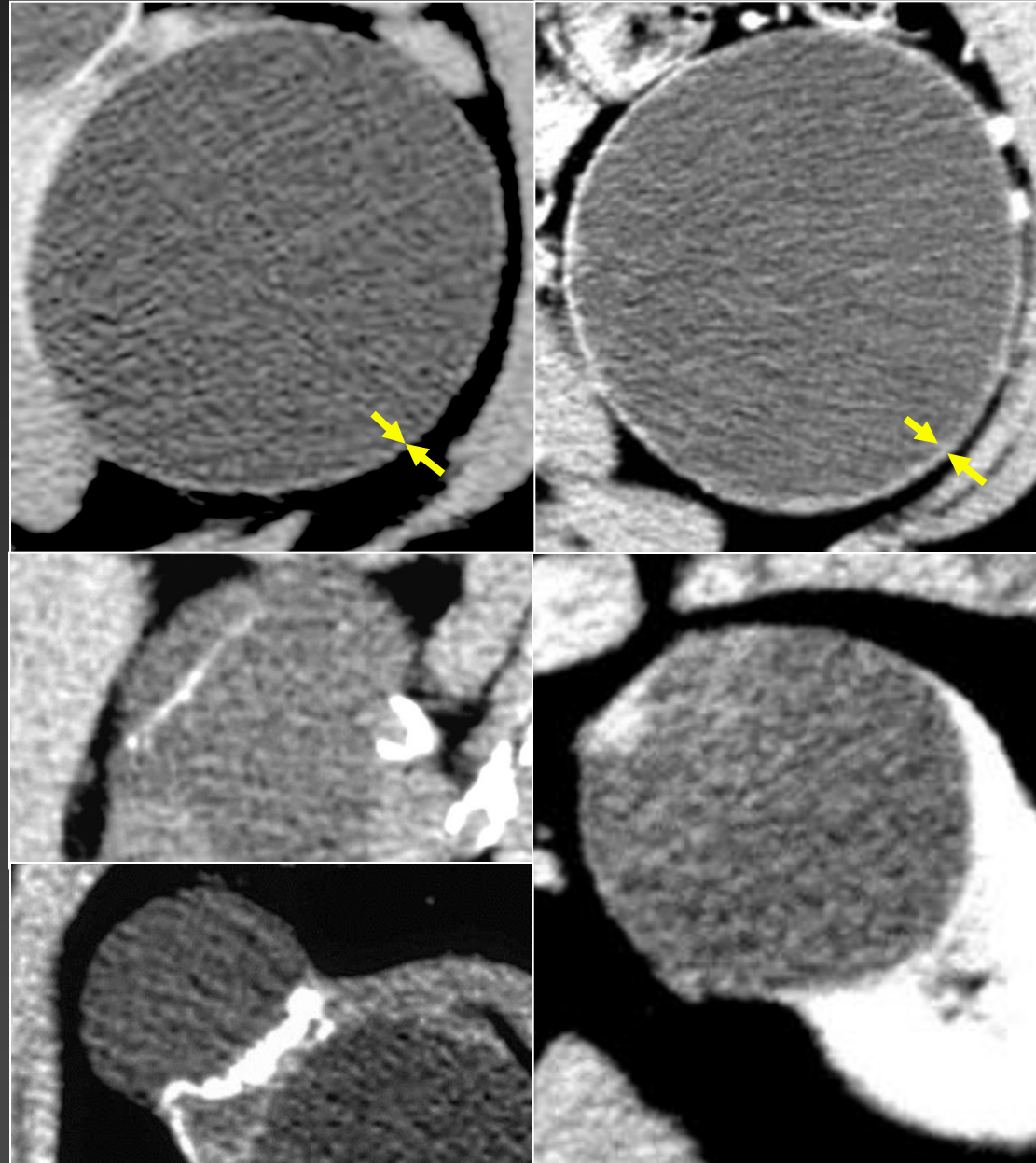
Rehaussement:

Perceptible vs marqué

■ Les calcifications

Fines ou épaisses

Régulière vs irrégul.



Classification de Bosniak

Objectif:

- Séparer les « kystes » supracm chirurgicaux (cat. III et IV) des non chirurgicaux (I, II et IIF)

Scanner: coupes $\leq 3\text{mm}$ et phase néphrogr.++

- **Efficacité (n=116*; n=42**) et CAT**

Cat I et II: 100% bénin ➔ **STOP**

Cat IIF: 5% malin CCR ➔ **Suivi 5A**

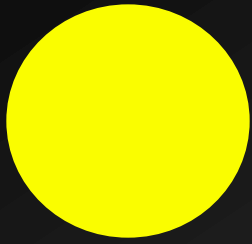
Cat III: 50-60% malin CCR ➔ **Chirurgie**

Cat IV: 100% malin CCR ➔ **Chirurgie**

* CURRY N Cystic renal masses: accurate Bosniak classification requires adequate renal CT, AJR 2000

** ISRAEL GM, BOSNIAK MA. Follow-up CT of moderately complex cystic lesions of the kidney (Bosniak category IIF). AJR 2003

Type I



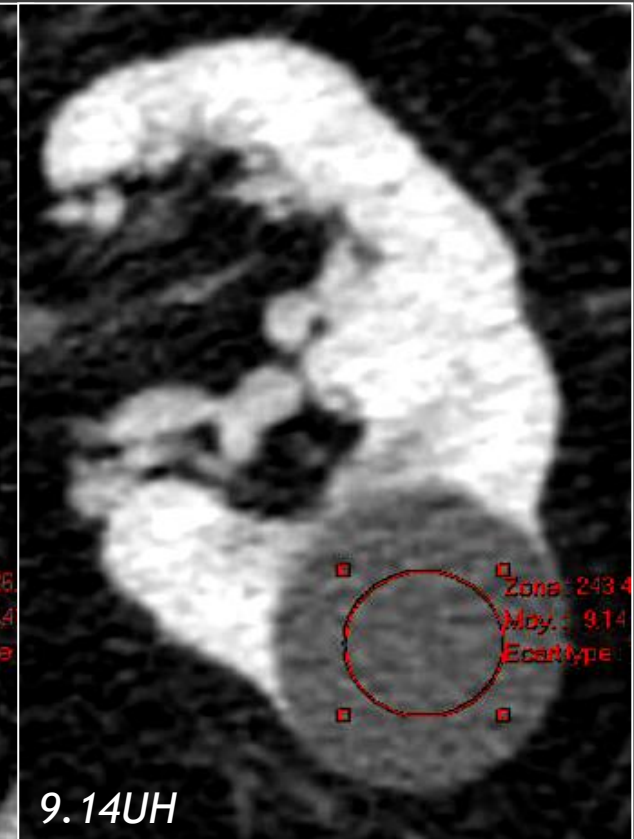
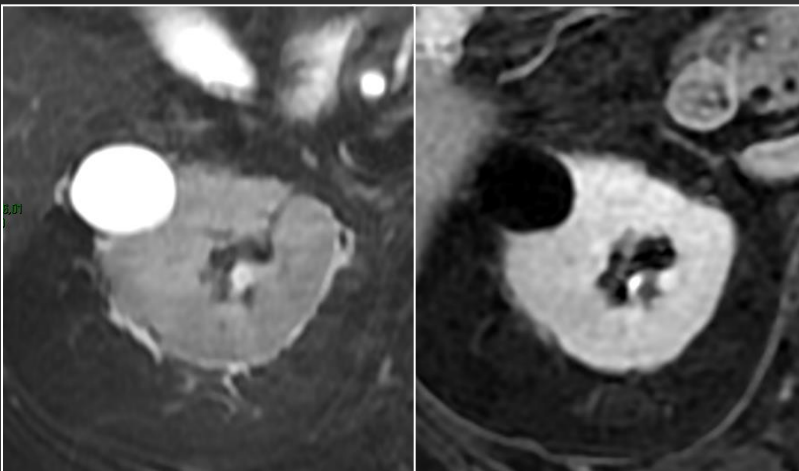
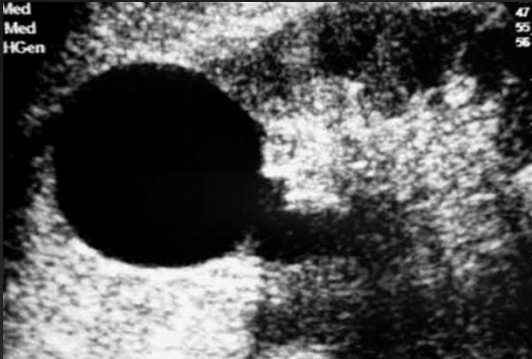
Paroi non visible

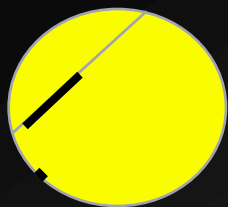
Signal hydrique $\leq 15UH$

Variation pre/post $\Delta UH < +10UH$



- *Echogr. diagnostique dans la majorité des cas de kystes simples*



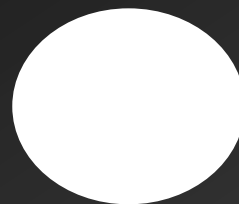
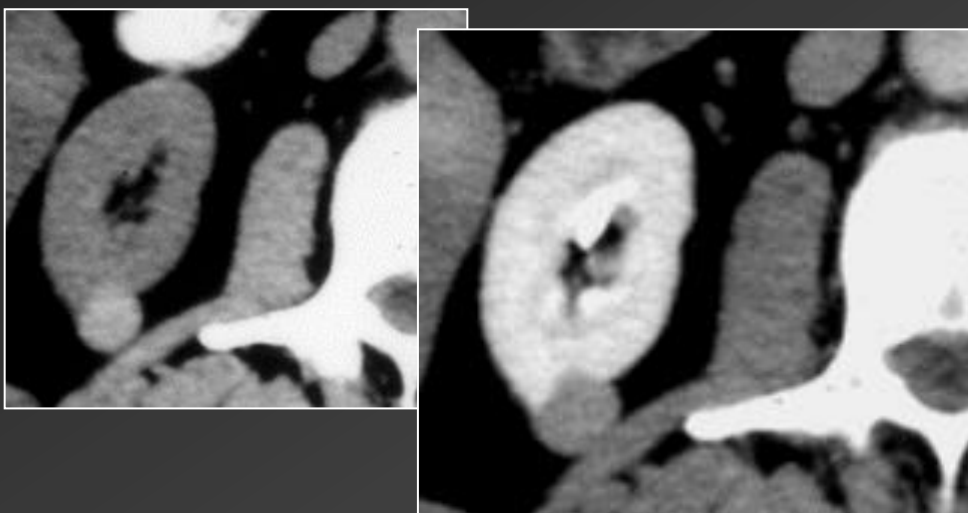
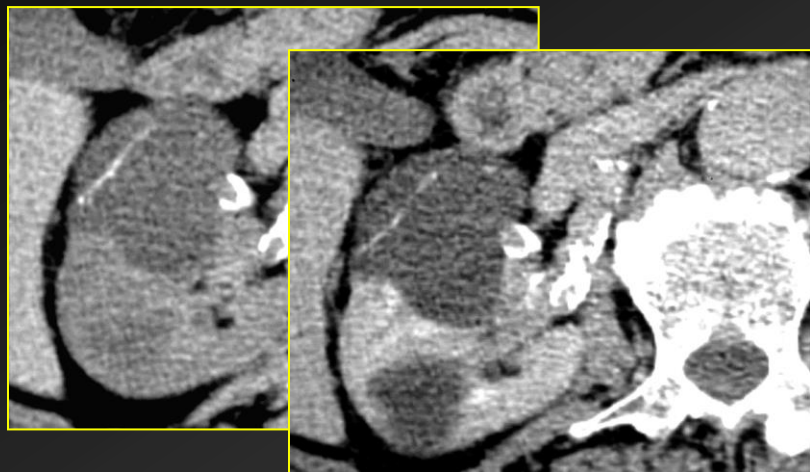


Type II

Kyste finement cloisonné

Kyste finement calcifié

Petit kyste hyperdense ss capsulaire



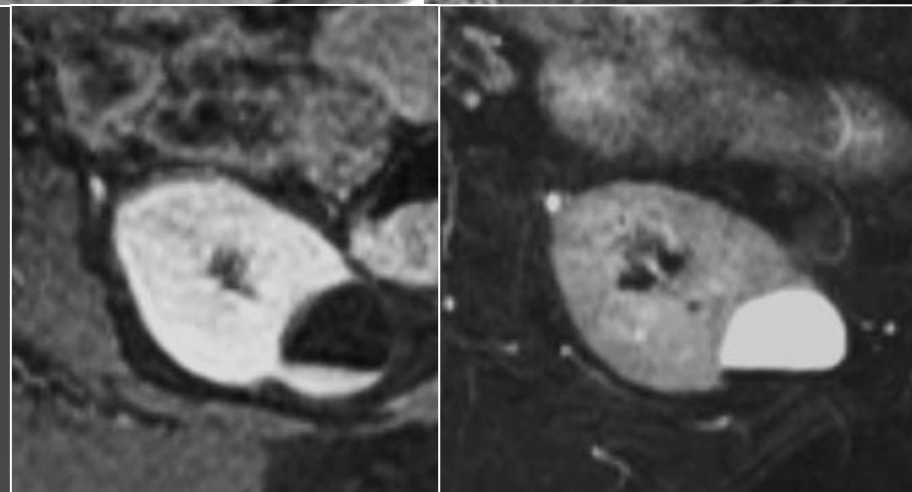
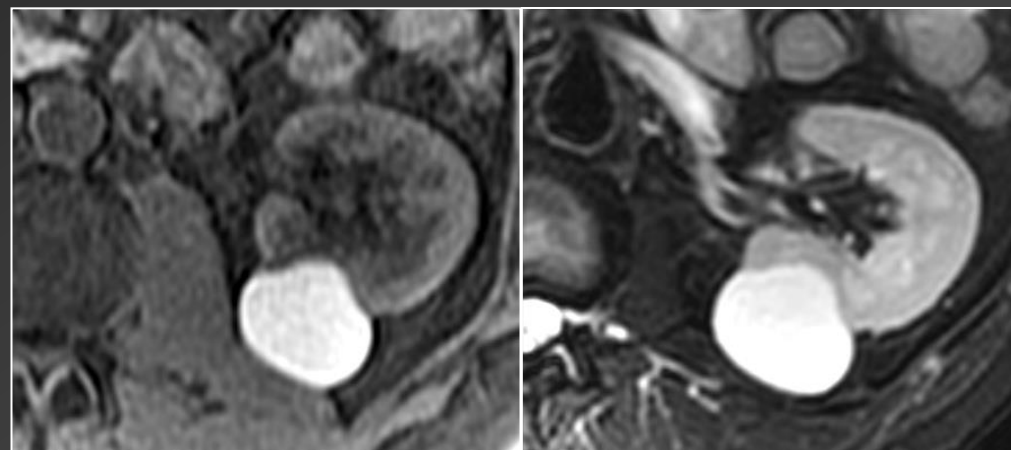
Type II hyperdense

= Type I + $D \geq 50UH$

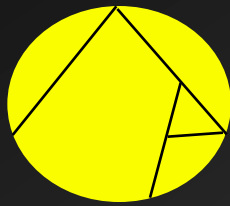
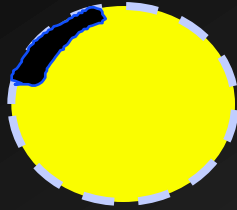
Hémorragie ancienne

Riche en protéines

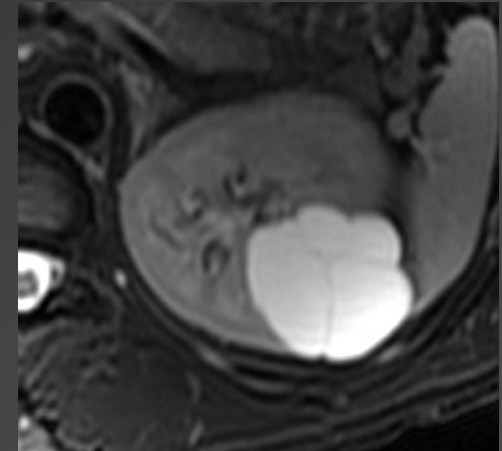
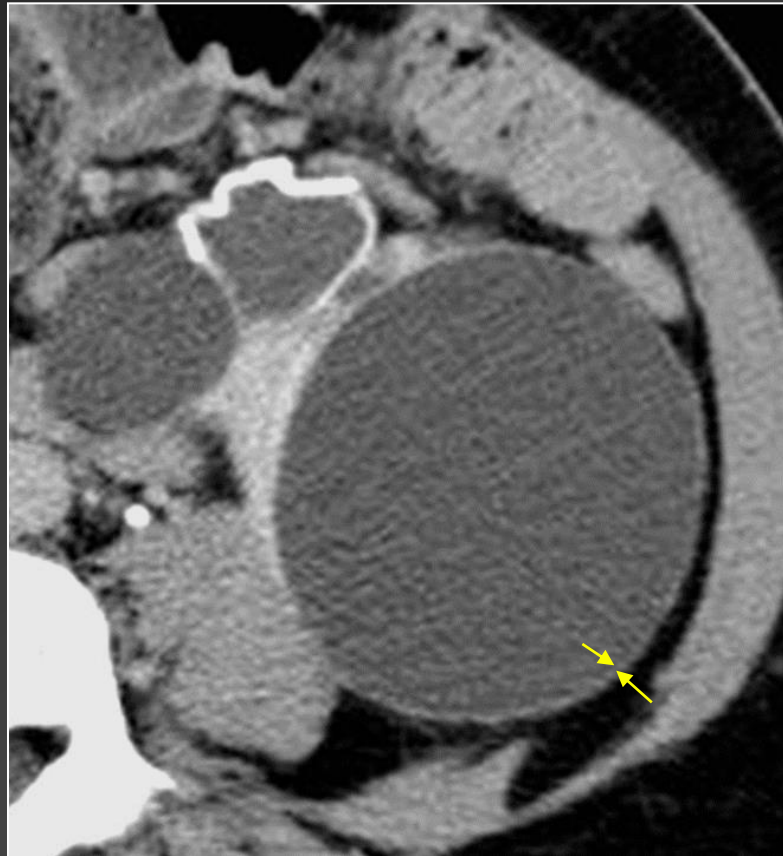
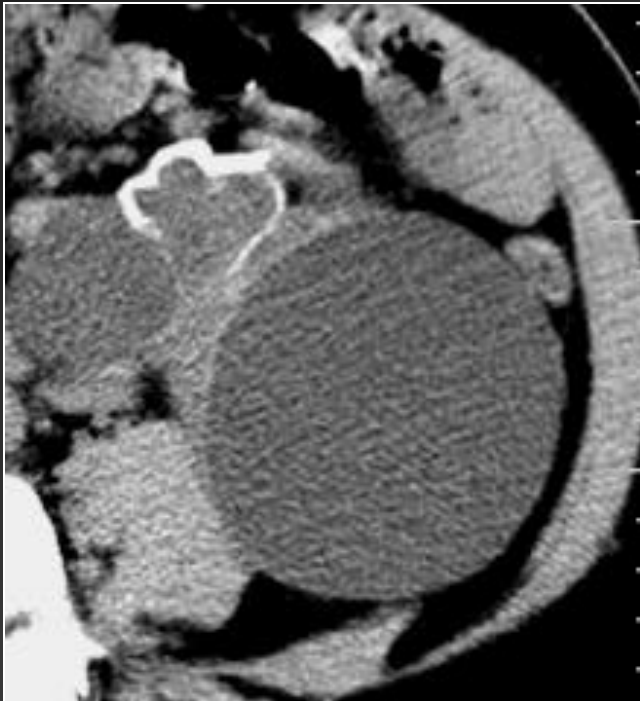
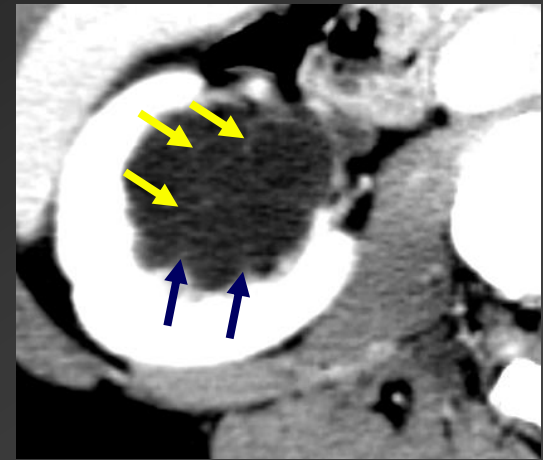
« Lait » calcique

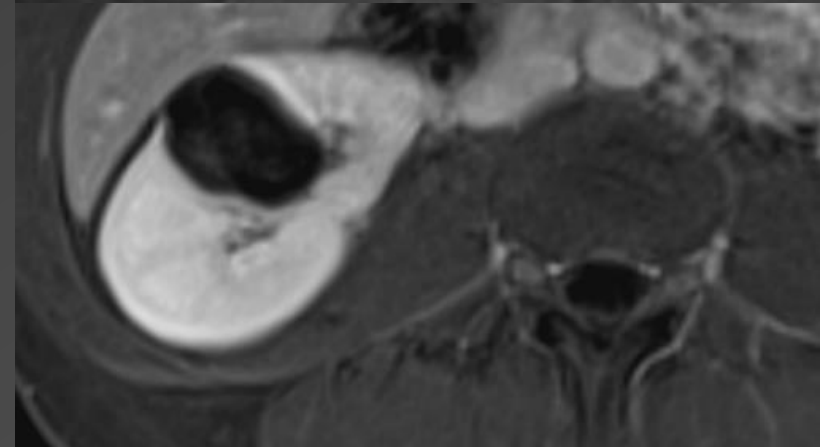
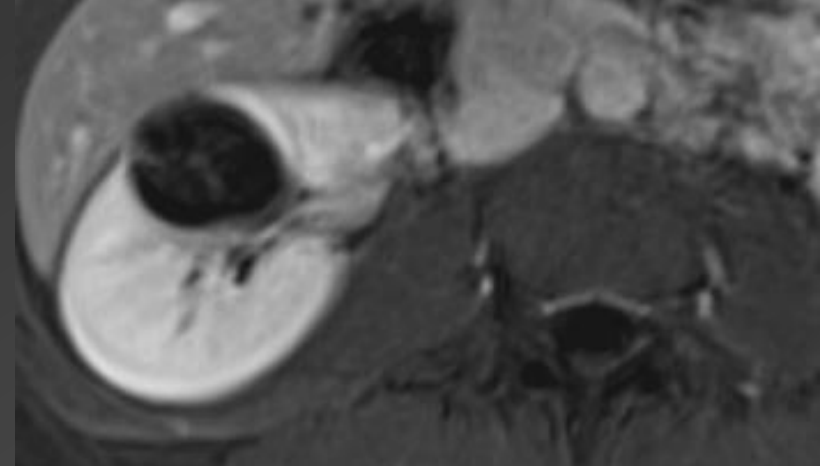
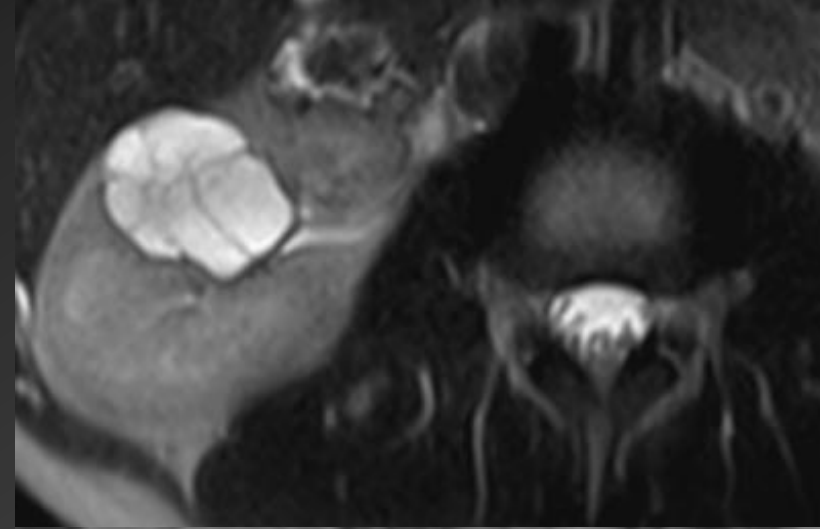
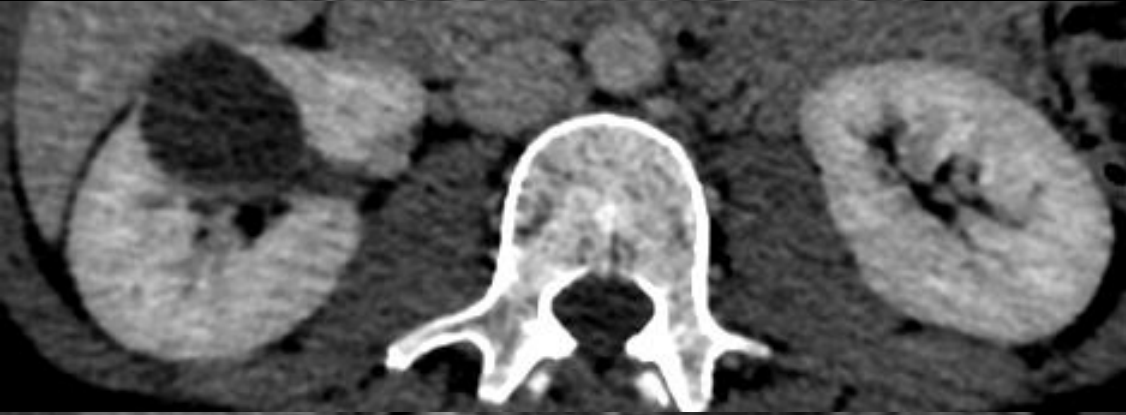
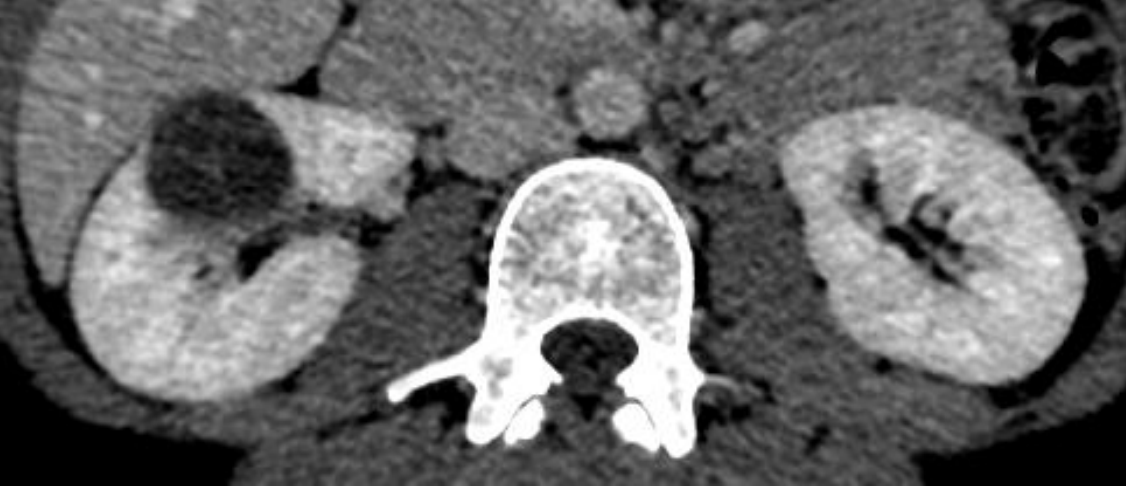


Type IIF

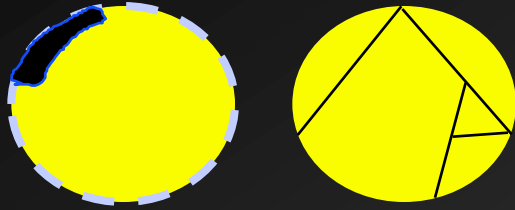


- . Cloisons nombreuses « hairline-thin » (>2)
- . Paroi visible millimétrique (non mesurable)
- . Rehaussement faible «perceptible»

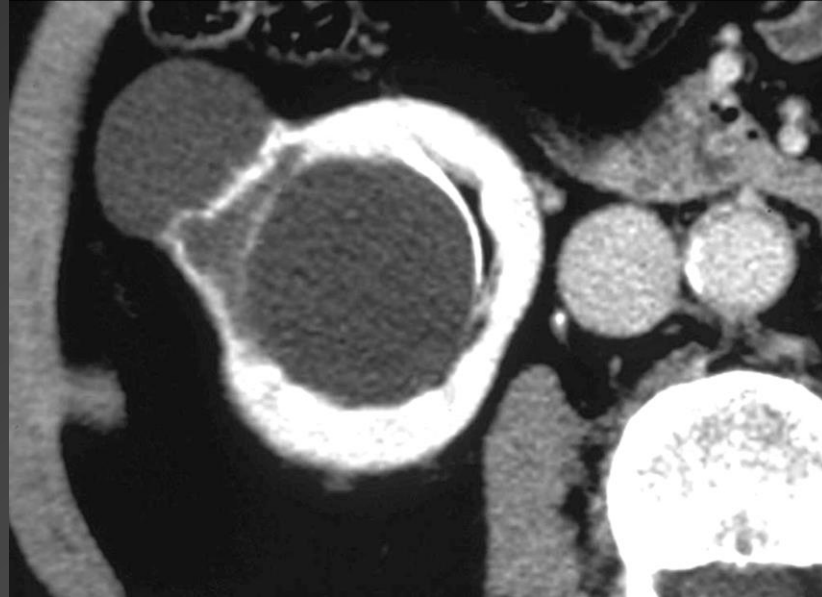
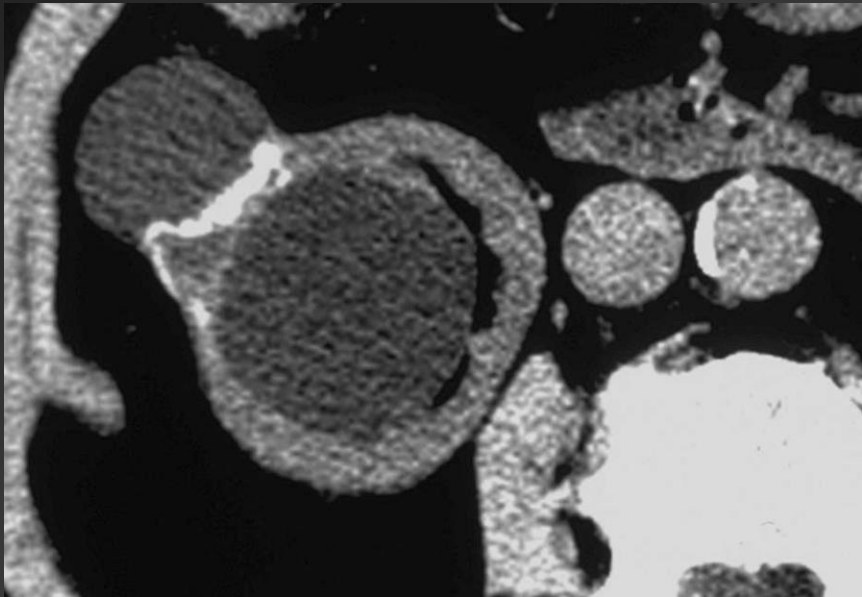
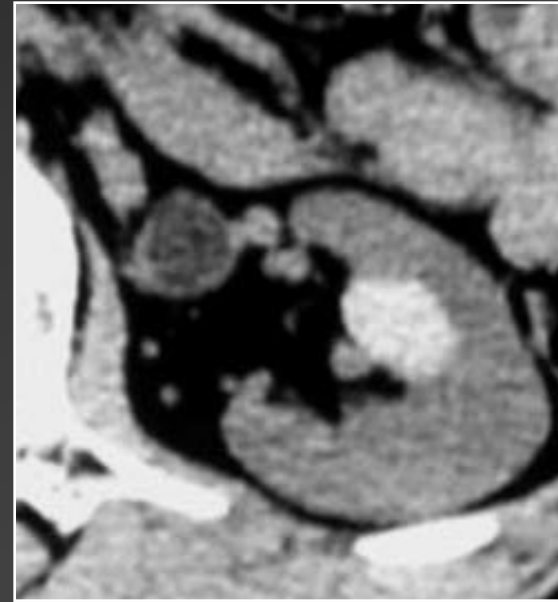




Type IIF

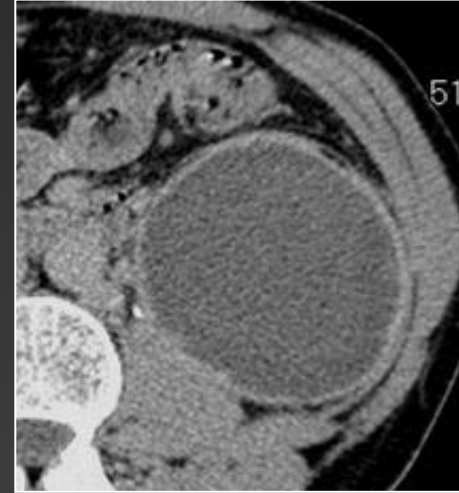
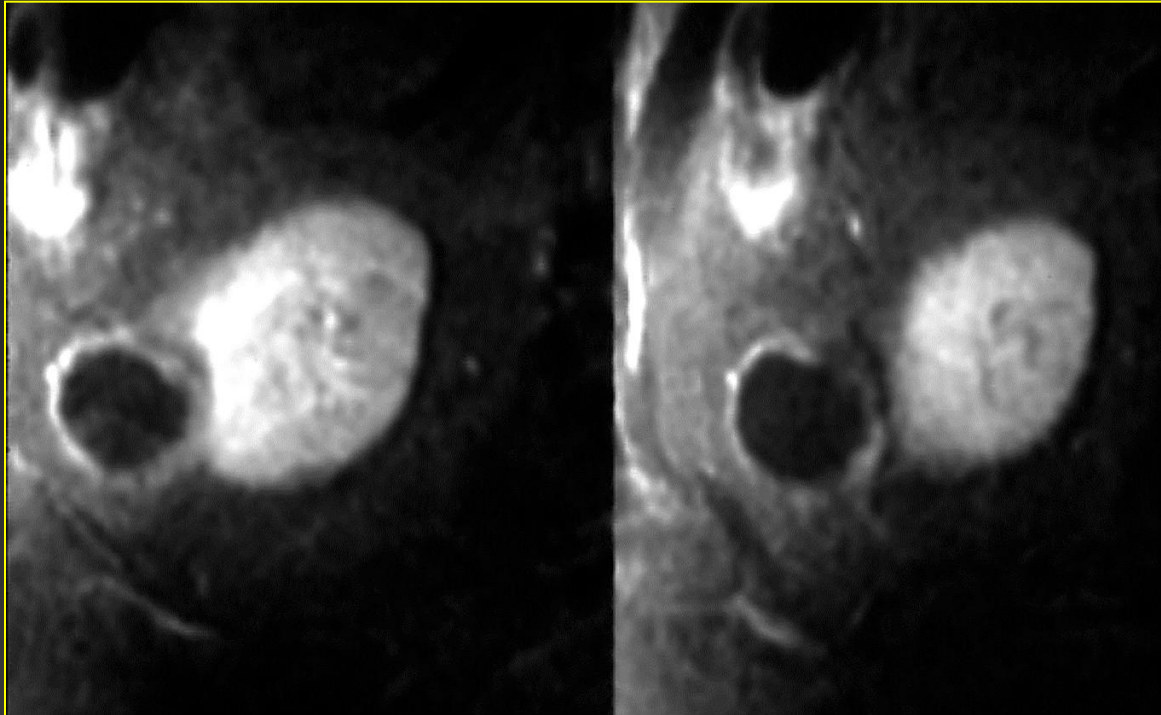


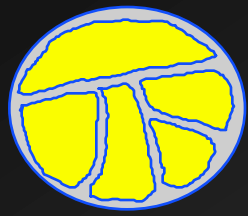
- . *Epaisse calcification sans rehaussement*
- . *«Kystes hyperdenses» gros (>3cm) ou intraparenchymateux*





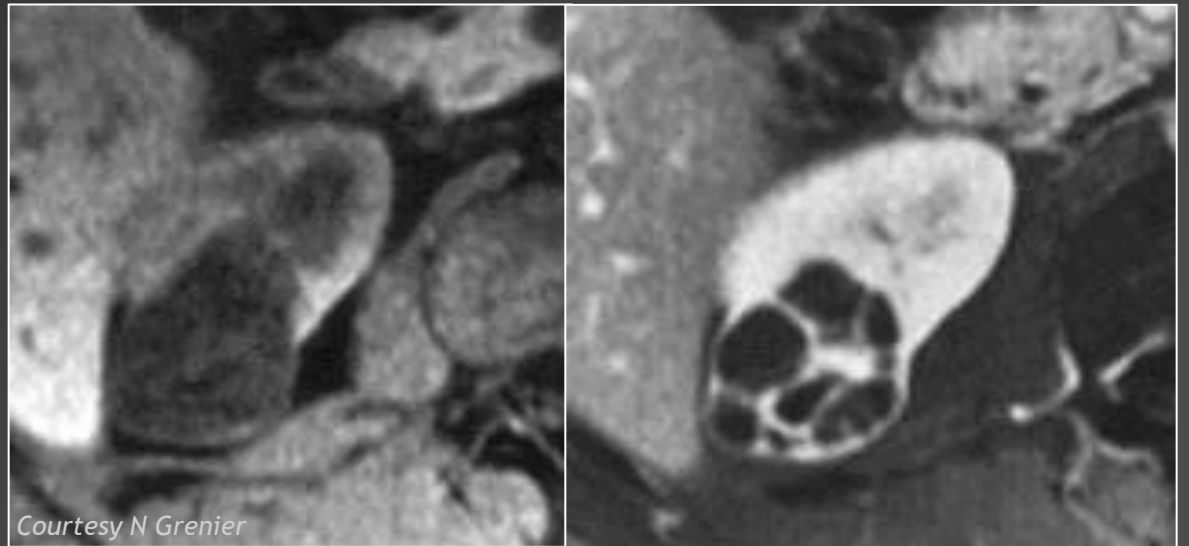
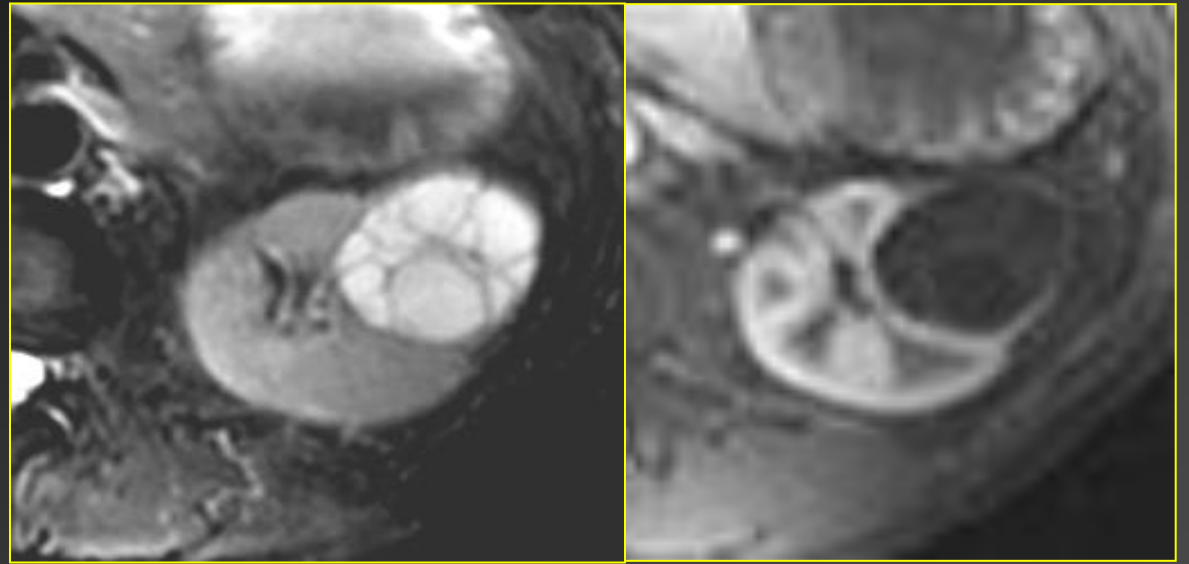
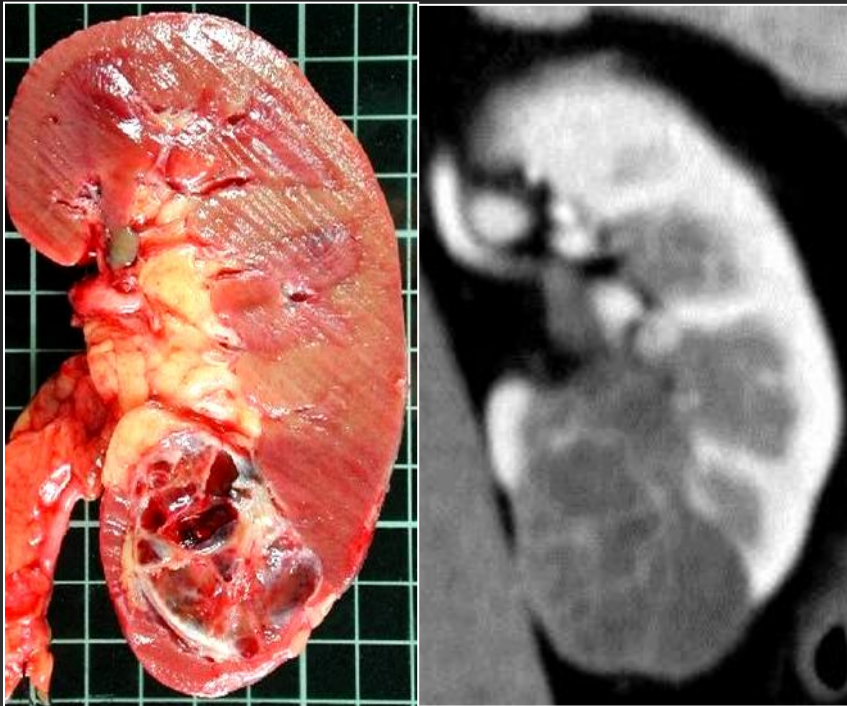
Type III Uniloculaire
Paroi épaisse régulière
Rehaussement +





Type III Multiloculaire

Paroi épaisse et cloisons
Rehaussement +

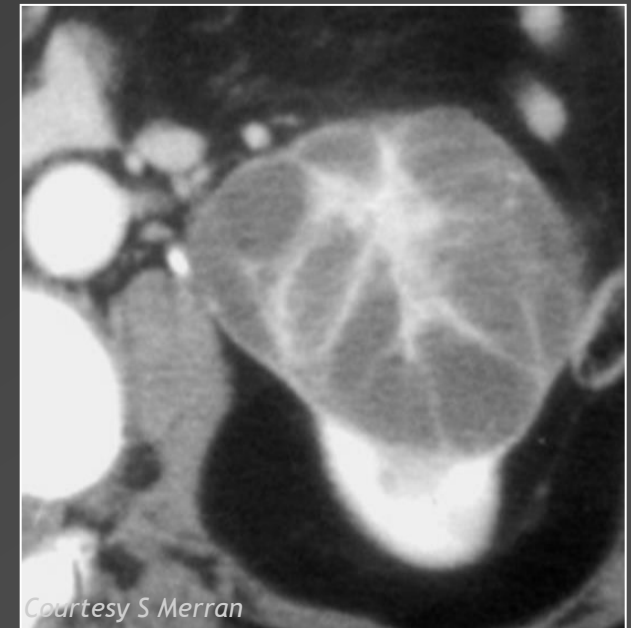
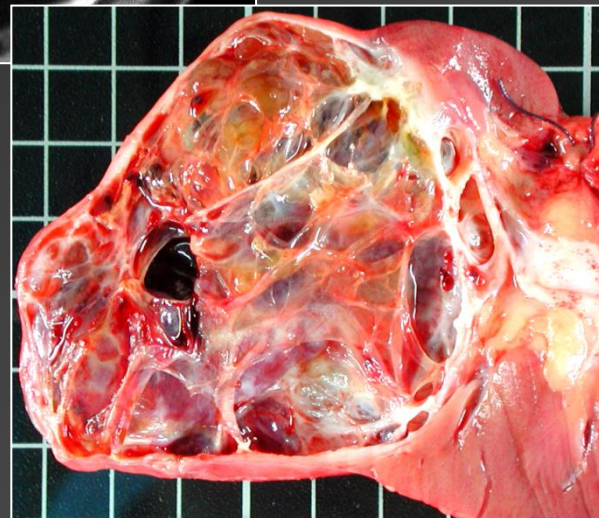
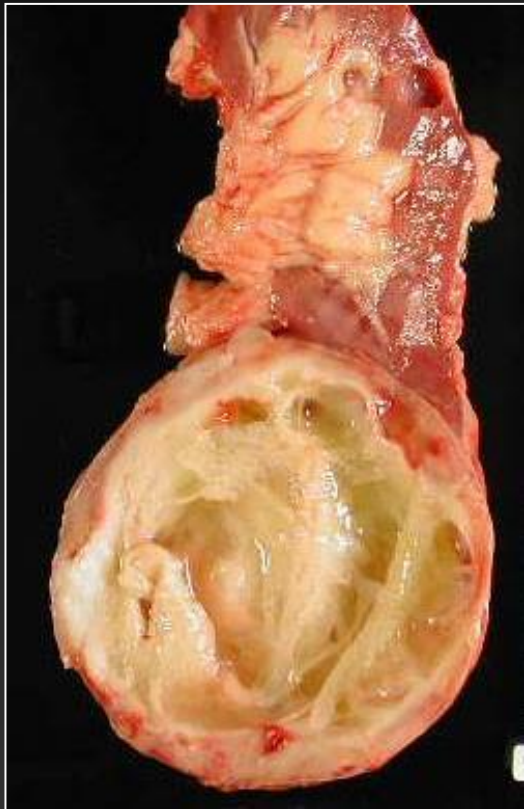
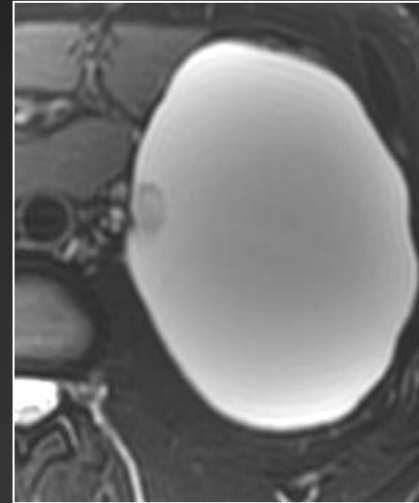


Courtesy N Grenier

Type IV

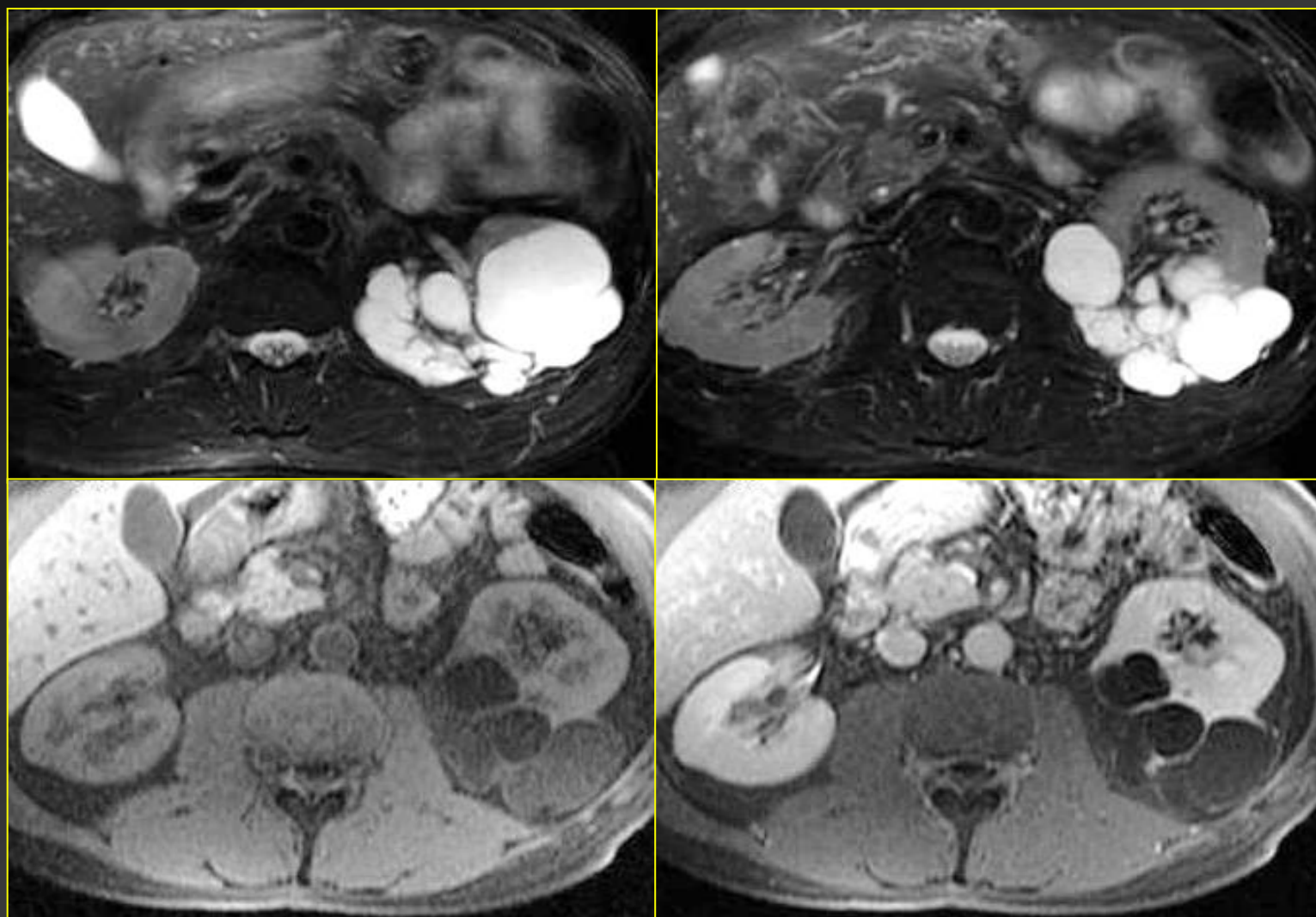
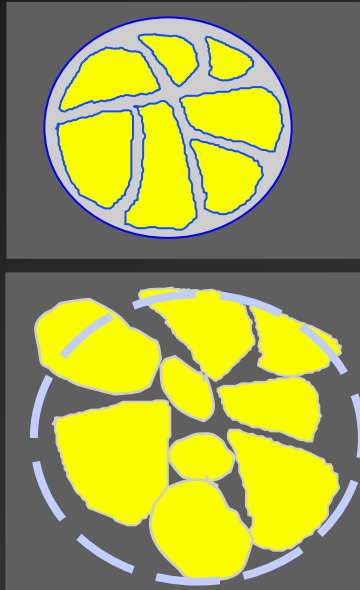


Type IV
multiloculaire
Rehaussement +



Courtesy S Merran

IRM
Cat III multiloc.
Chir. prévue
**Votre avis
et attitude ?**



Dystrophie kystique localisée :

- ≠ Tum. encapsulée ≠ des maladies kystiques héréditaires
- Unilatéral; focal ou diffus; rein de taille normale
- Groupe de kystes non encapsulé → **Surveillance**

Les «kystes» infracm inclassables

■ Les très petites lésions (<10mm)

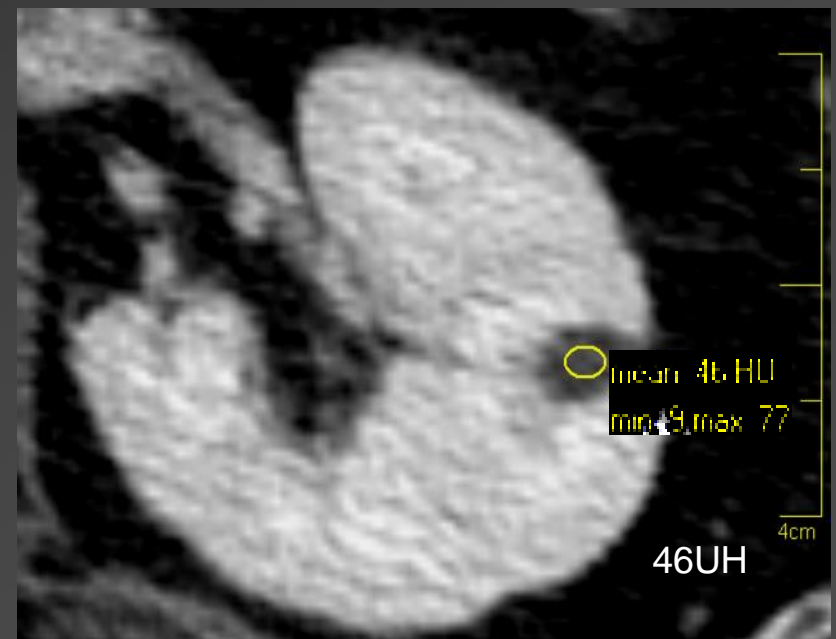
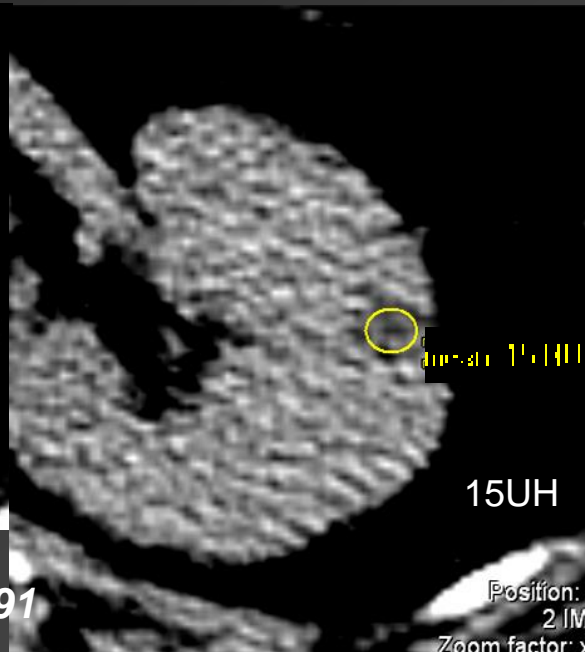
Densité postcontraste indéterminée

Population générale adulte *:

Microkyste (hautement prob.) → stop

Surtout si densité spontanée hydrique

Fenêtre étroite → hypodense/cortex



* Bosniak MA Radiology 1991
Curry NS AJR 1995

Les «kystes» infracm inclassables

■ Les très petites lésions (<10mm)

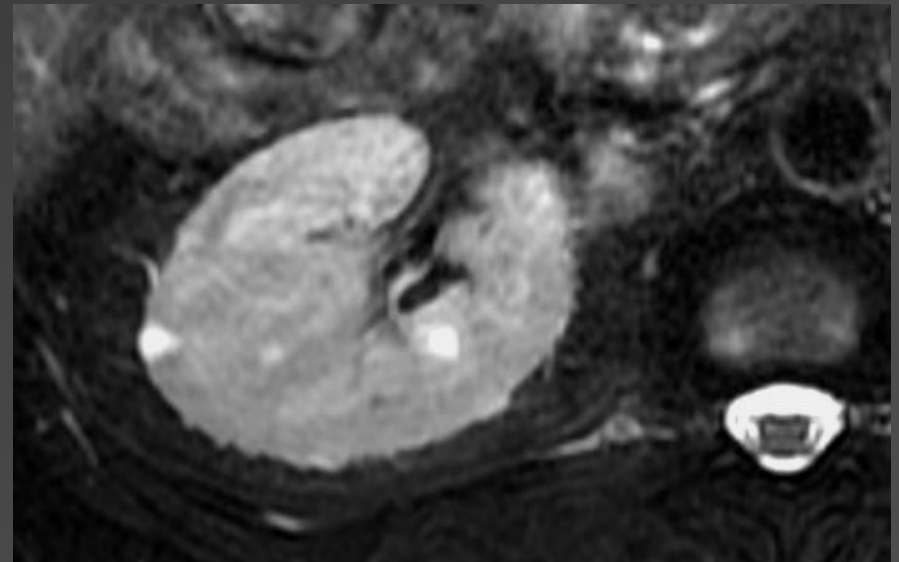
Population à risque de CCR

CCR traité ou synchrone

CCR familiaux (VHL, BHD, papillaires)

➔ **surveillance active (microlésion non chir)**

➔ ou IRM T2w (FSE ou SSFSE avec fatsat)



Les «kystes» supracm inclassables

- **Densité spontanée entre 20 et 50UH**

Kyste dense atypique

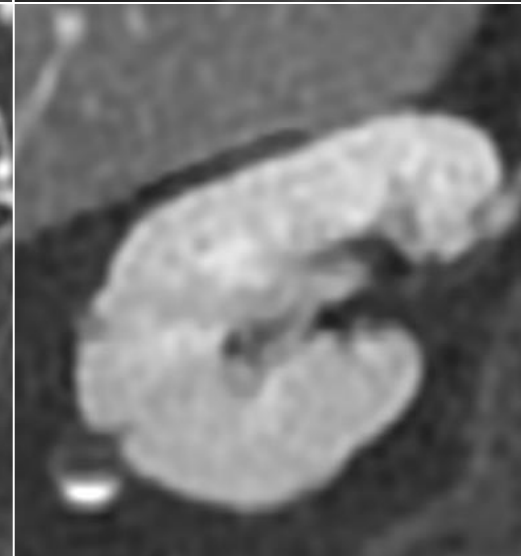
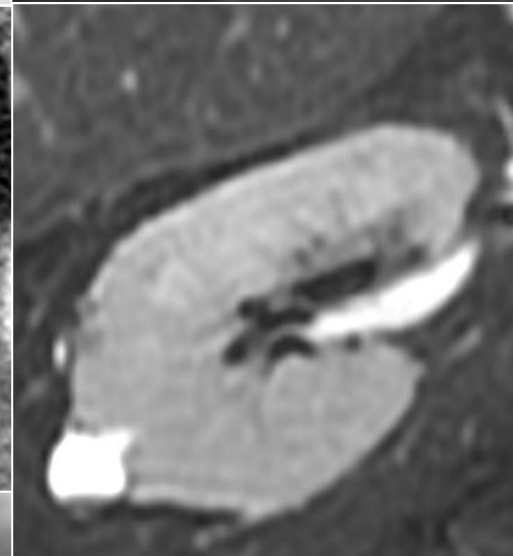
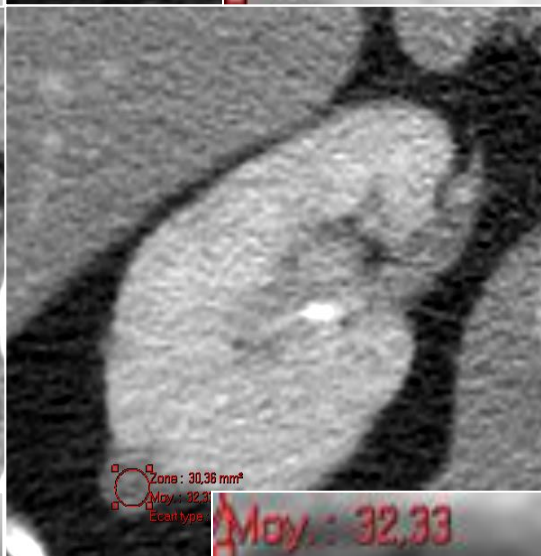
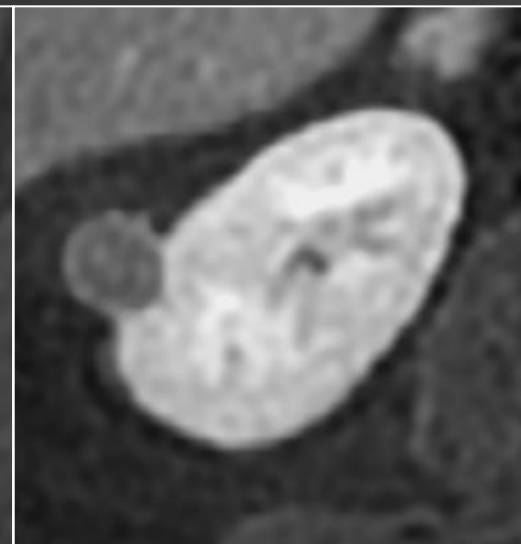
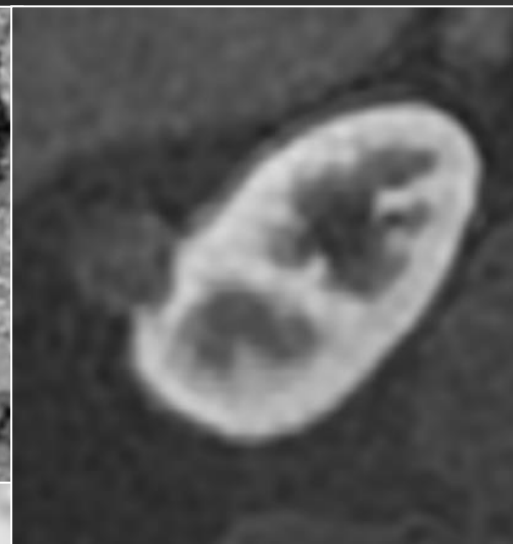
Diag diff.: CCR solide papillaire (rehauss. neg 6%) *

- ➔ Echographie ciblée ± contraste
- ➔ IRM signal caractéristique (2/3 des cas)



* Couvidat C, Eiss D, Merran S, Vieillefond A, Correas JM, Hélénon O. Papillary renal cell carcinoma: spectrum of imaging findings with pathologic correlation J Radiol (in press)

Les «kystes» supracm inclassables



Les «kystes» supracm inclassables

■ Δ UH «limite» +10 à +20UH

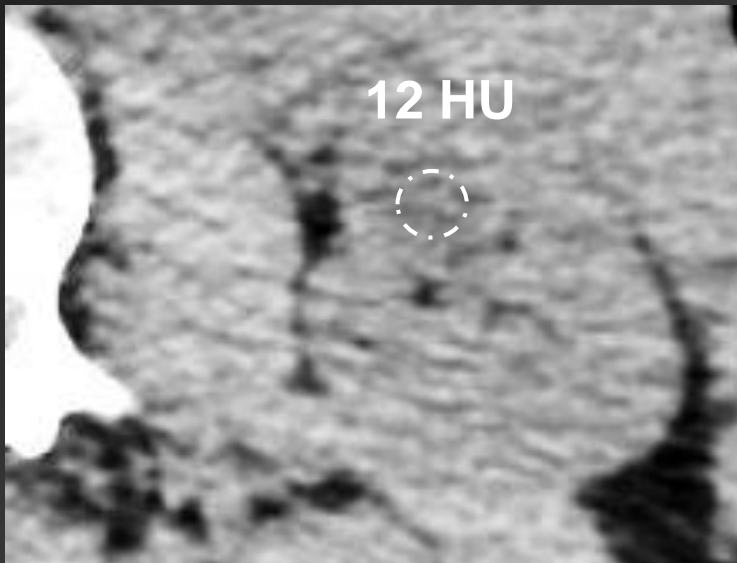
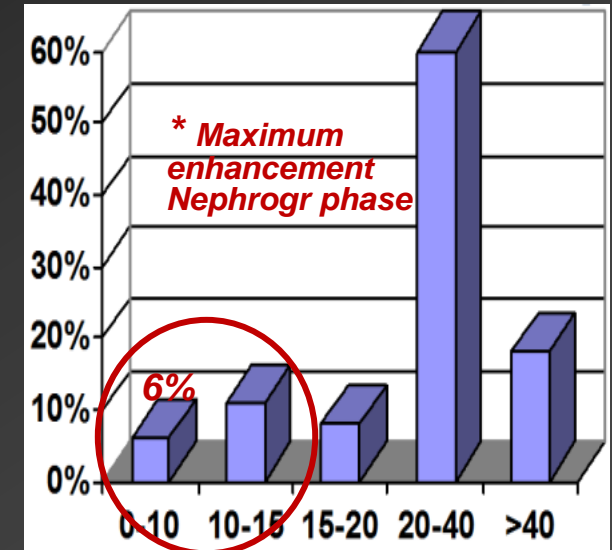
Phénomène «beam hardening»*

Forte prob. si hydrique avt inj.

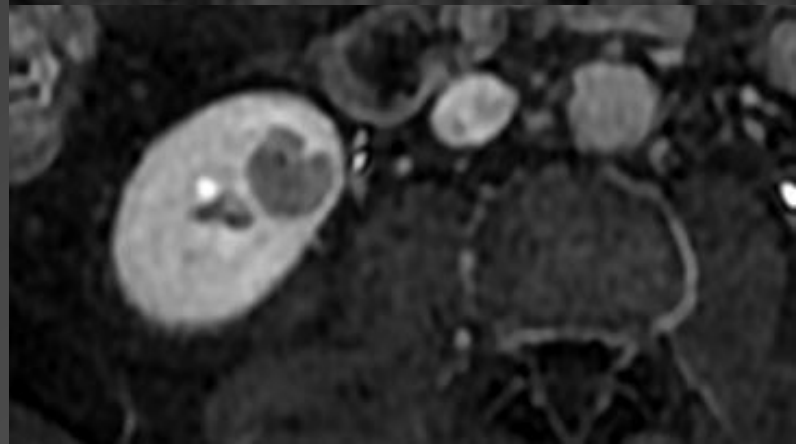
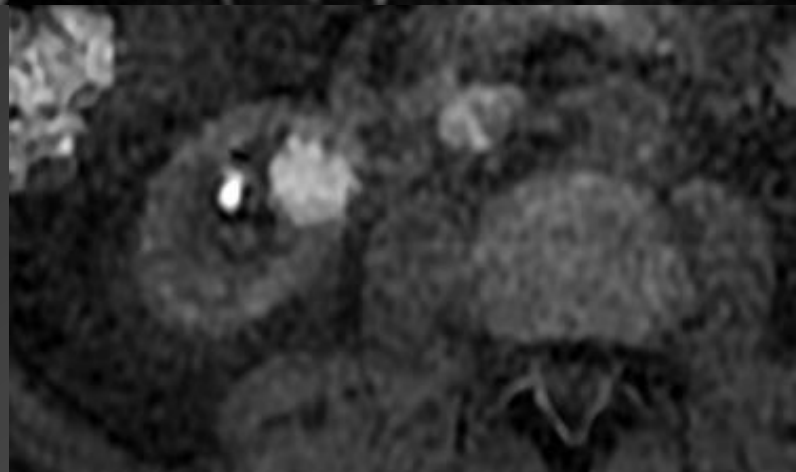
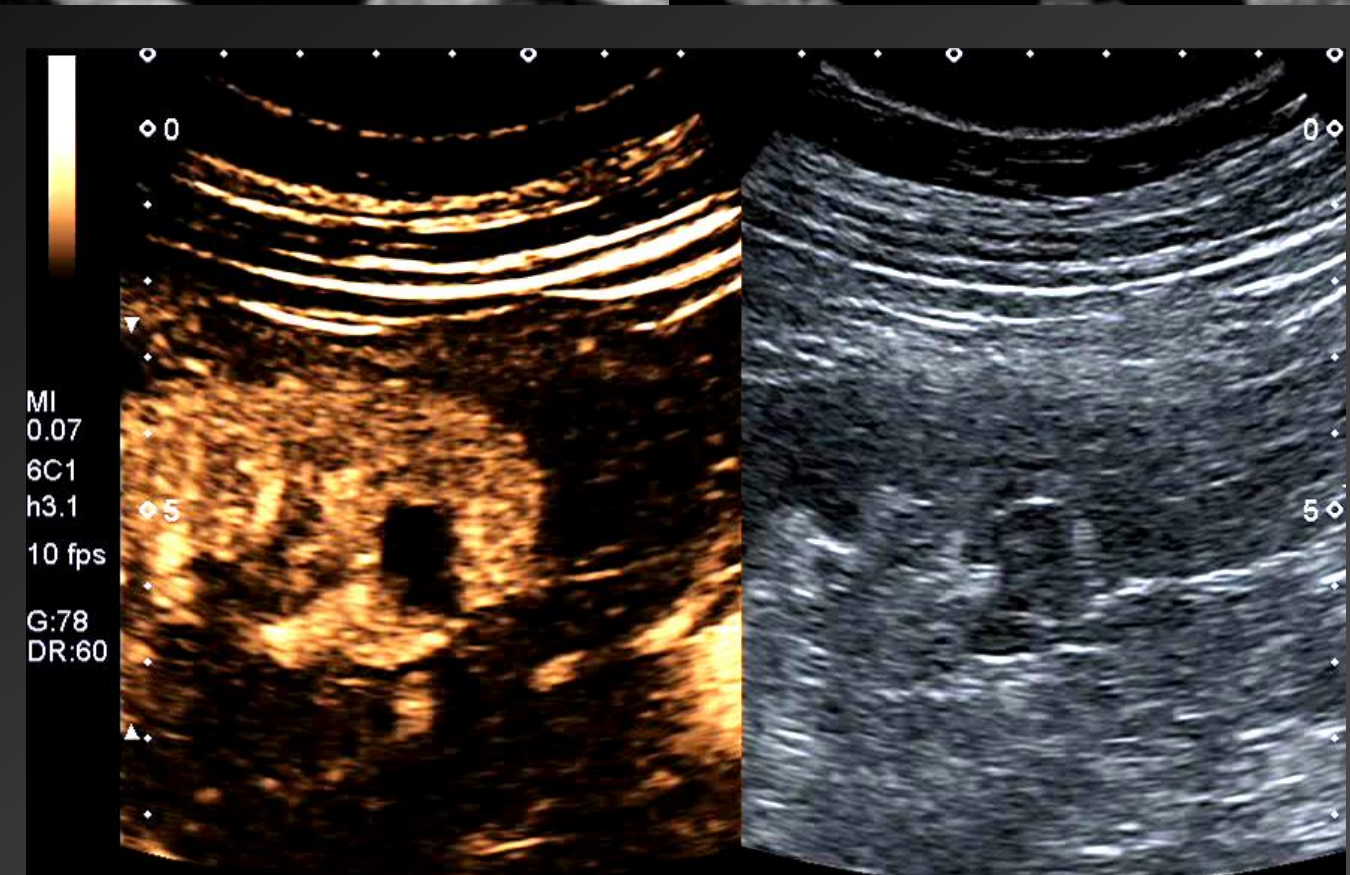
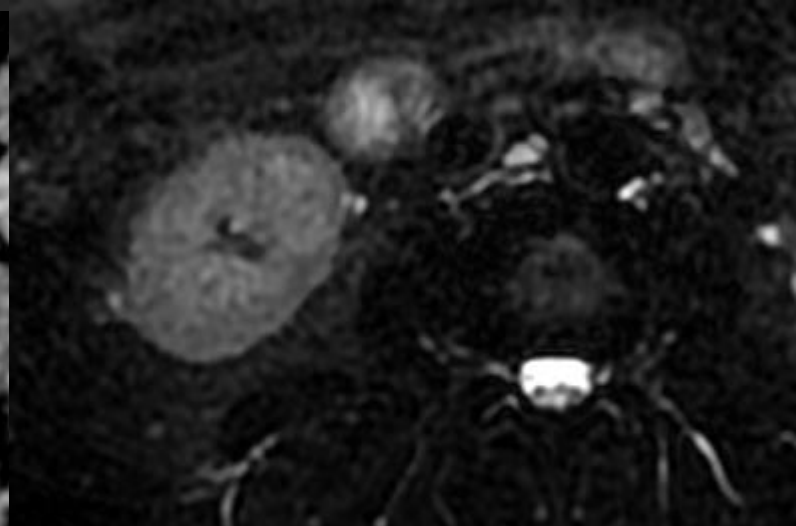
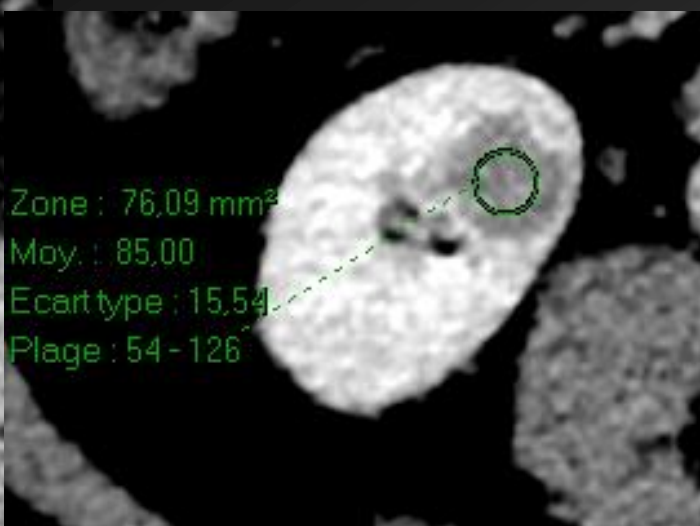
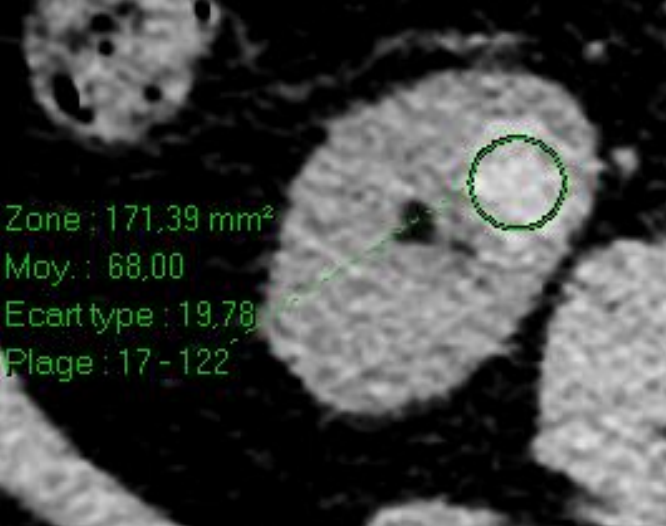
Diag diff.: CCR solide papillaire

➔ Echographie ciblée \pm contraste

➔ IRM 2e intention



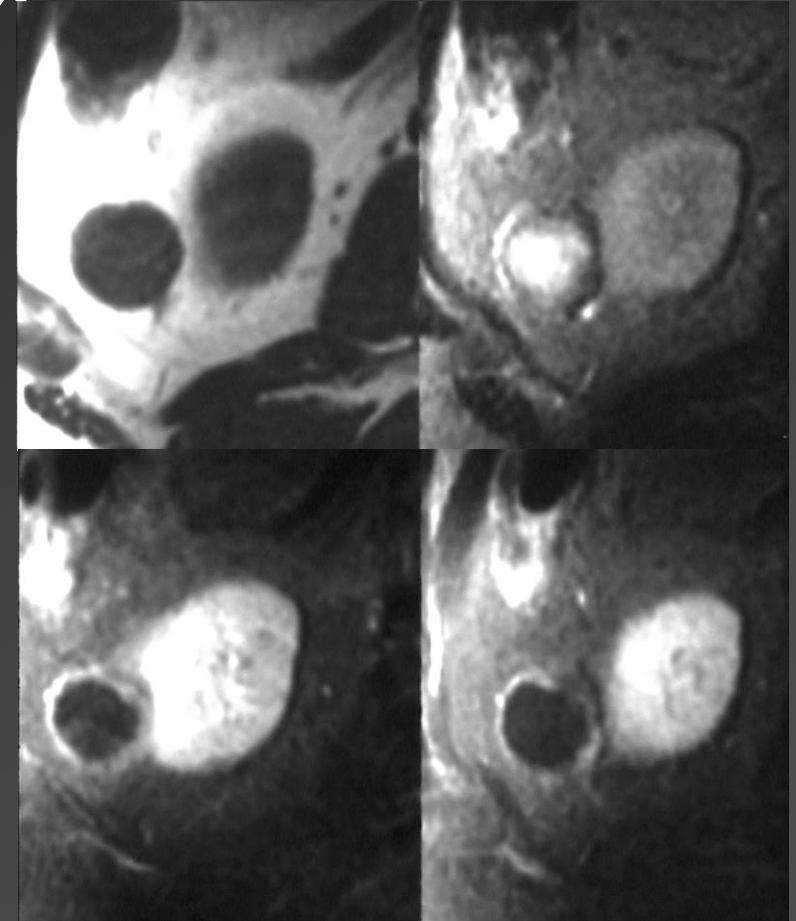
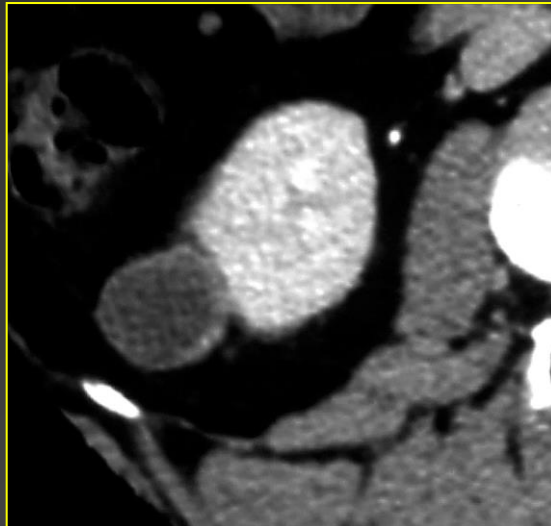
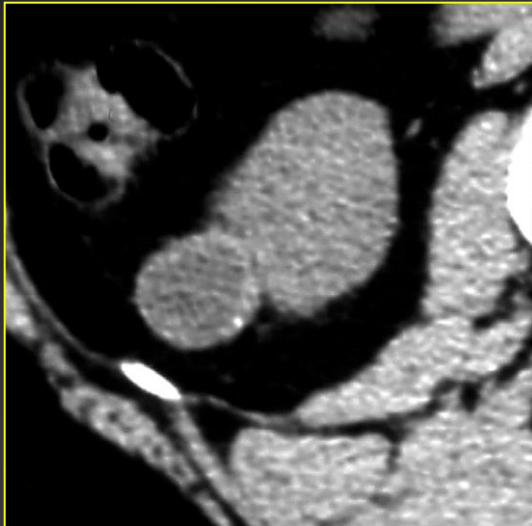
* Couvidat C, Eiss D, Merran S, Vieillefond A, Correas JM, Hélénon O. Papillary renal cell carcinoma: spectrum of imaging findings with pathologic correlation J Radiol (in press)



Les masses kystiques inclassables

Type « III » avec rehaussement négatif

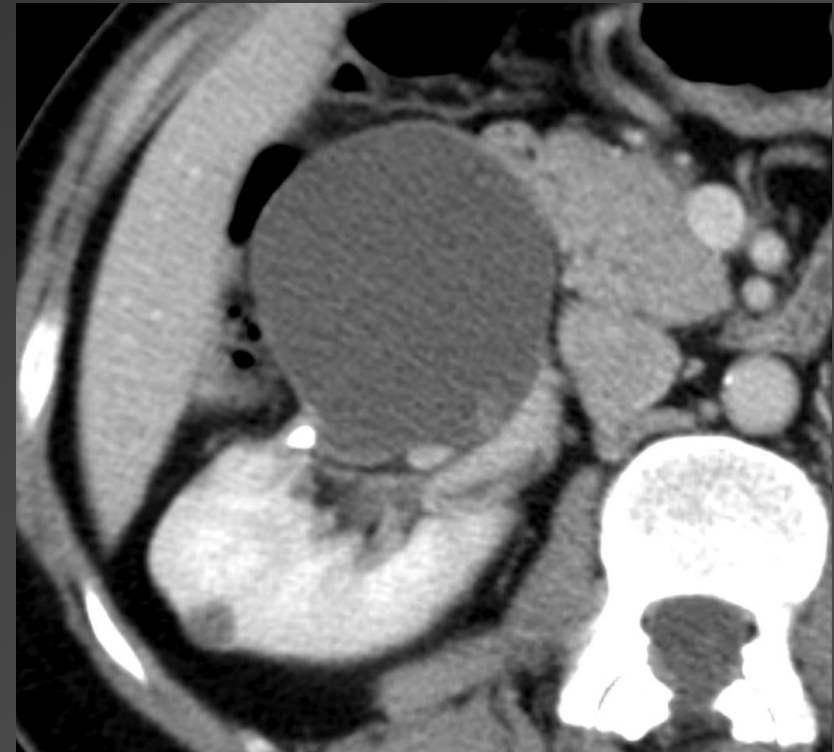
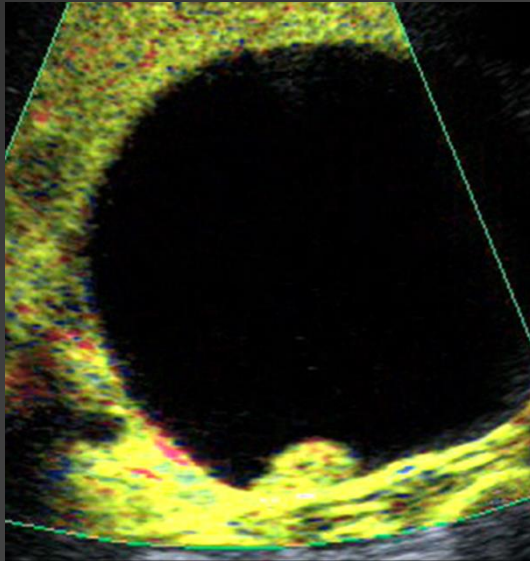
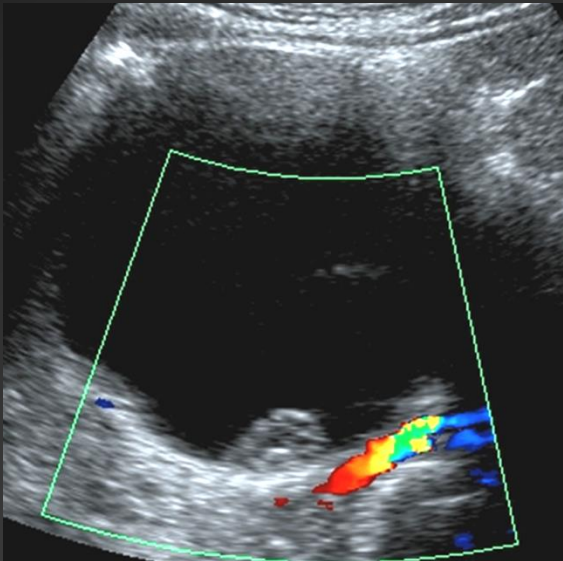
- Scanner
Type III rehaussement - ou douteux
- Conduite à tenir
 - ➔ Echo de contraste «ciblée»
 - ➔ IRM (Séq. dyn, Gd fatsat++)
 - ➔ *Si Gd+ reclassement en III chir.*



Les masses kystiques inclassables

Type « III » avec rehaussement négatif

- Scanner
Type III rehaussement - ou douteux
- Conduite à tenir
 - ➡ Echo de contraste «ciblée»
 - ➡ IRM (Séq. dyn, Gd fatsat++)
 - ➡ *Si Gd+ reclassement en III chir.*



Les masses kystiques mal classées

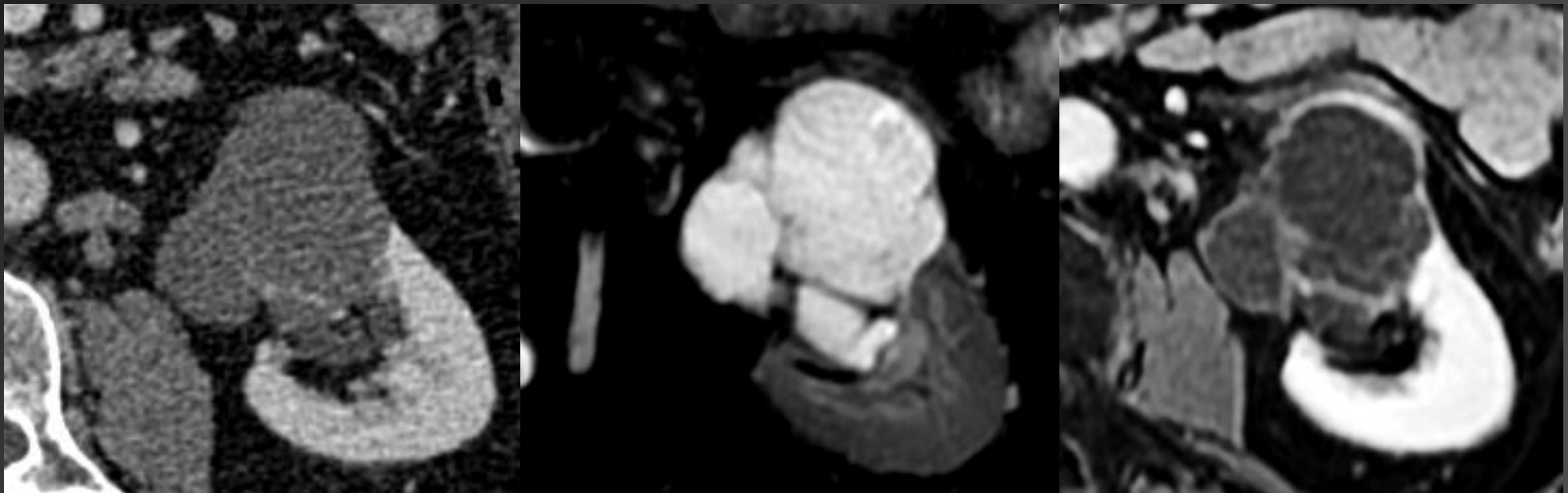
Lésions IIF sousclassées

■ CAT devant un IIF *

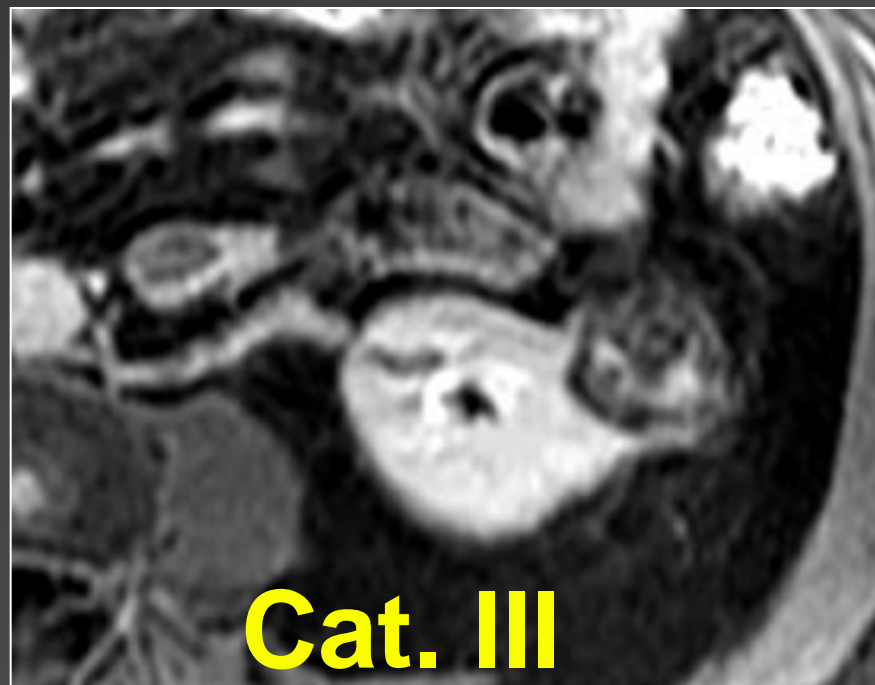
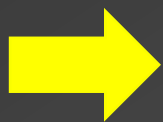
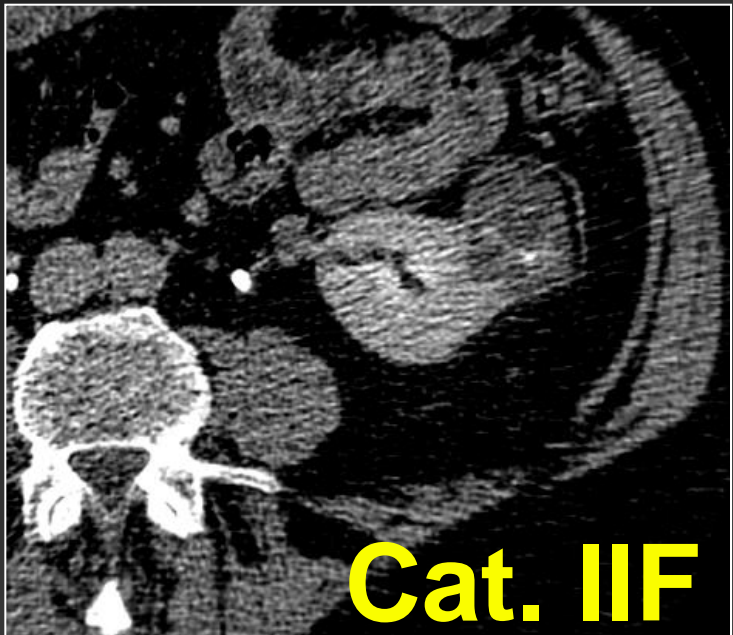
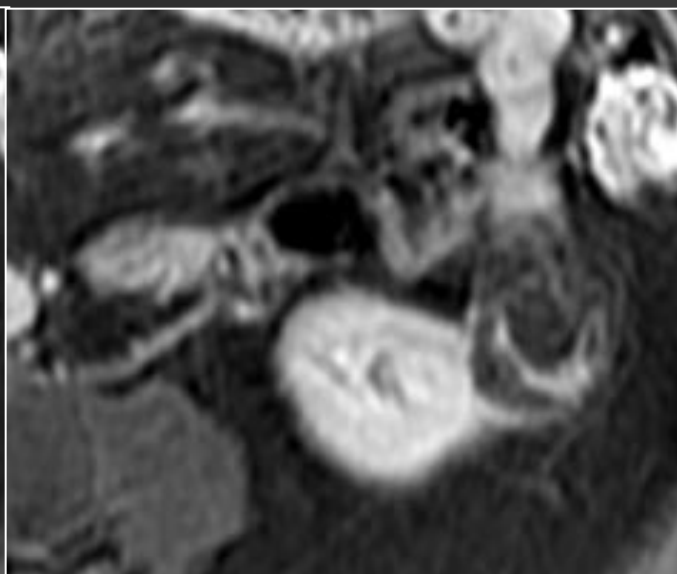
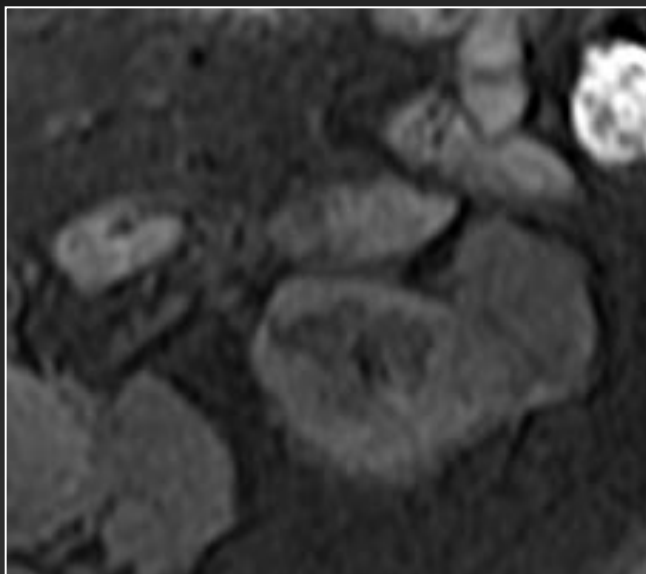
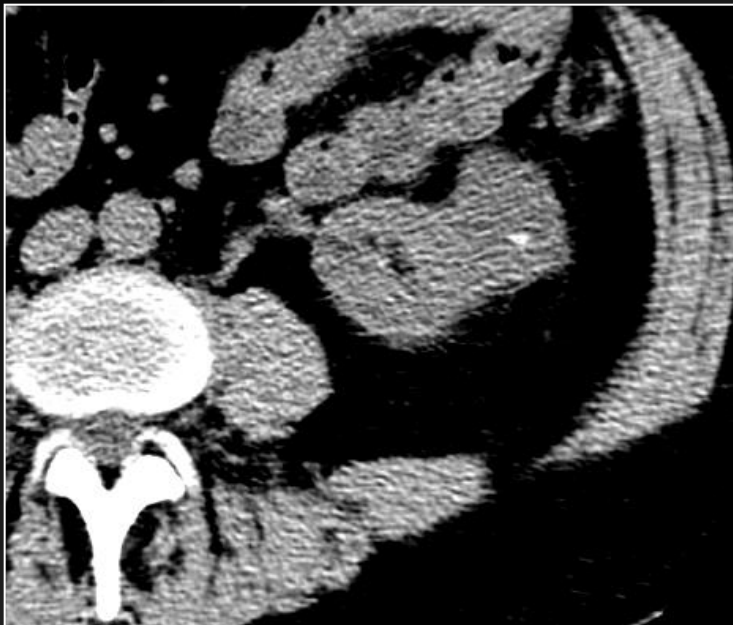
➔ IRM (USC+ en évaluation)

➔ ± Reclassement
en III ou IV chirurgicaux

Category		Septa/Wall		No. of Septa*		Outcome
CT	MR Imaging	CT	MR Imaging	CT	MR Imaging	
II	IIF	Hairline	Minimal	2	4	4-year stability
II	IIF	Hairline	Minimal	2	2	3-year stability
IIF	III	Hairline	Minimal	3	4	1-year stability
IIF	III	Minimal	Gross	3	3	Progression
IIF	III	Minimal	Gross	1	1	Benign
III	IV	Gross	Gross	1	2	Malignant
III	IV	Hairline	Hairline	1	1	Malignant



* From: ISRAEL GM, HINDMAN N, BOSNIAK MA. Evaluation of cystic renal masses: comparison of CT and MR imaging by using the Bosniak classification system. Radiology 2004



Les masses kystiques mal classées

Lésions sousclassées en IRM

■ Limites de l'IRM

Tum. Kyst. hémorragiques: hypersignaux T1

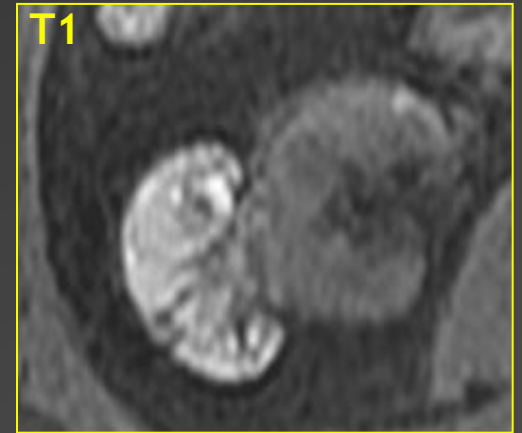
Dégradation de l'Hb : susceptibilité magnétique

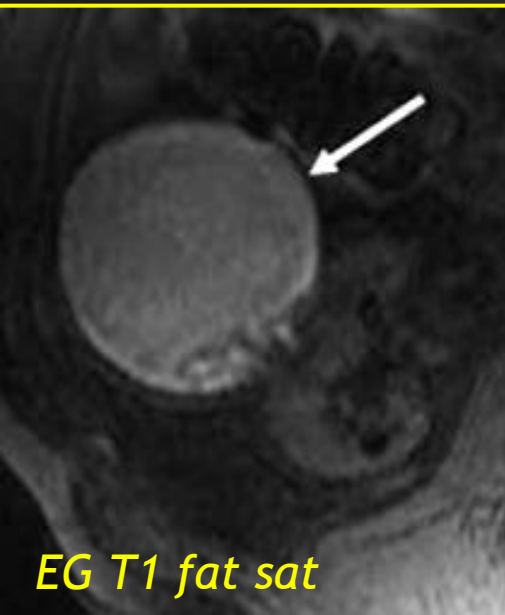
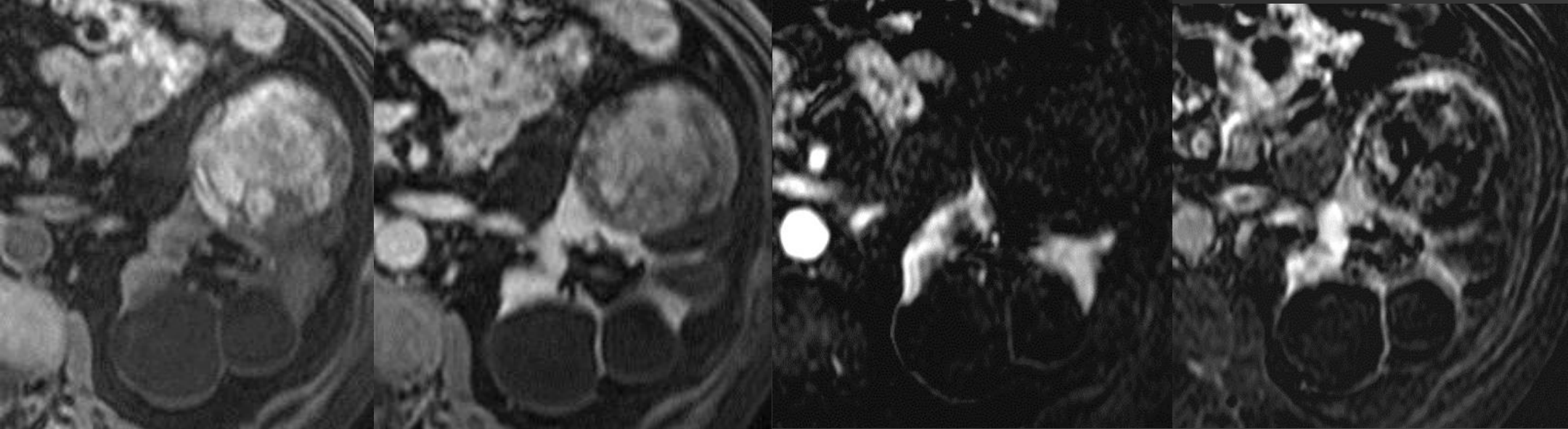
➡ Rehaussement masqué

➡ Valeur du T2 (hétérogénéité de signal)

➡ Intérêt soustraction (seq dynamique)

➡ Confrontation IRM / TDM

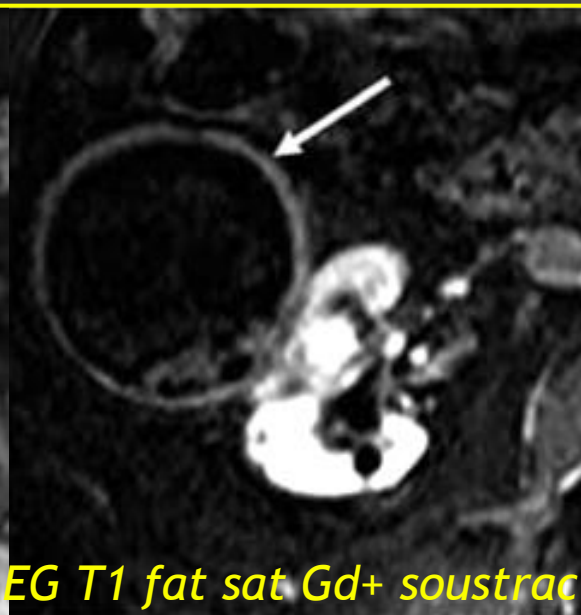




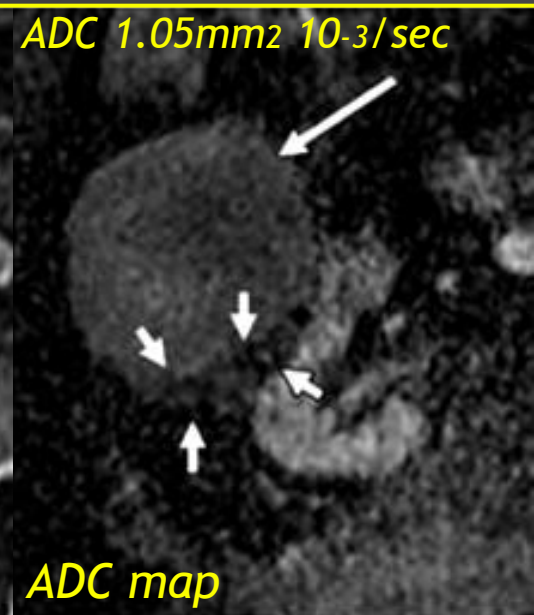
EG T1 fat sat



EG T1 fat sat Gd+



EG T1 fat sat Gd+ soustrac



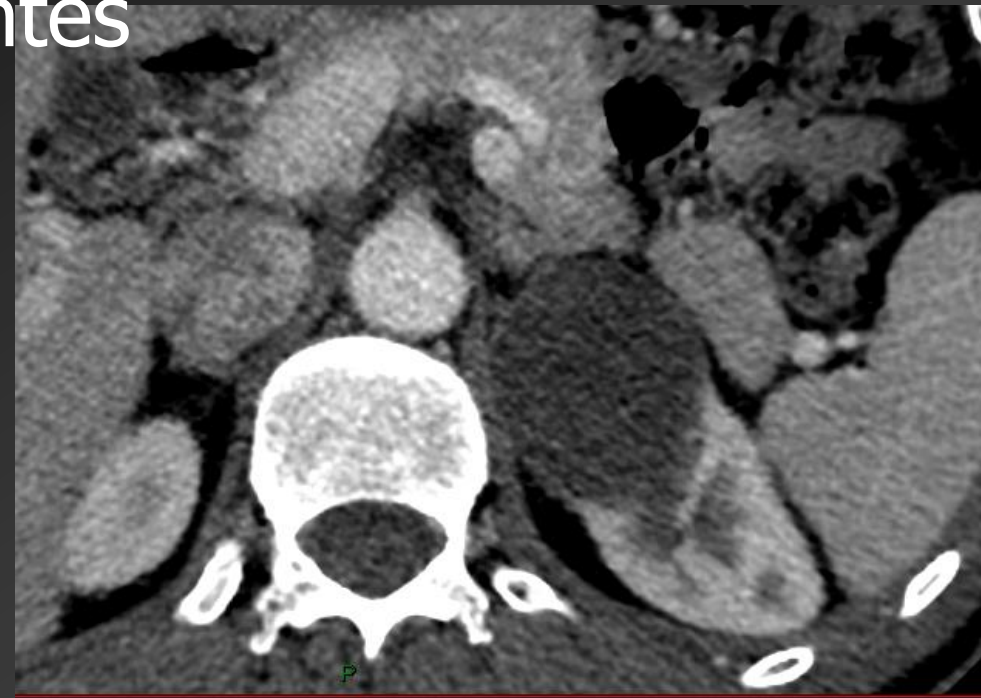
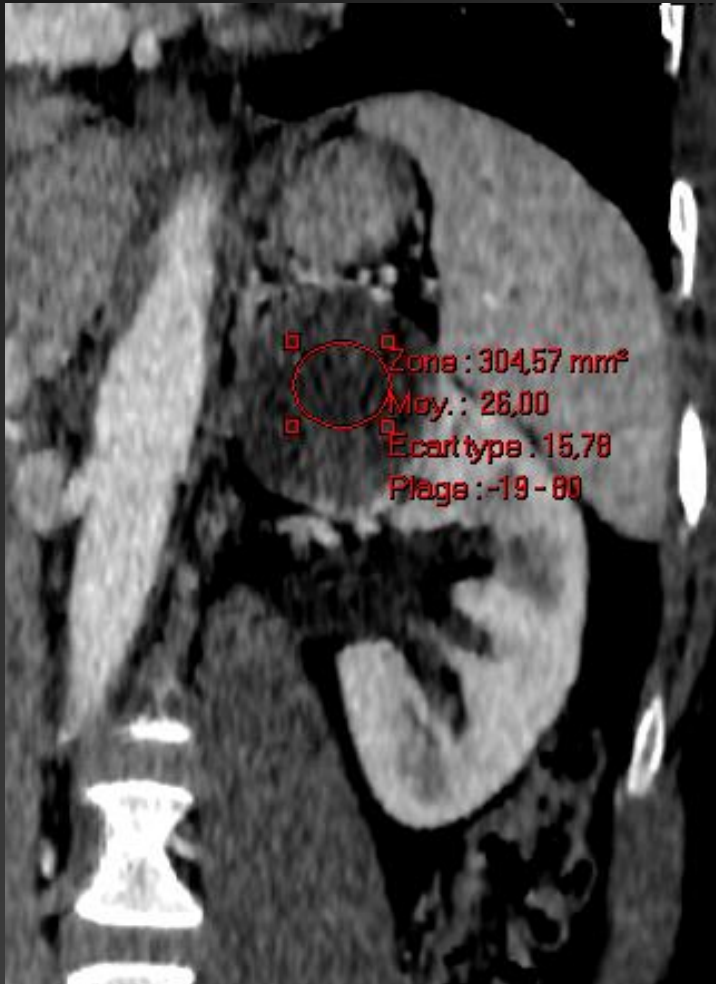
ADC 1.05mm² 10⁻³/sec

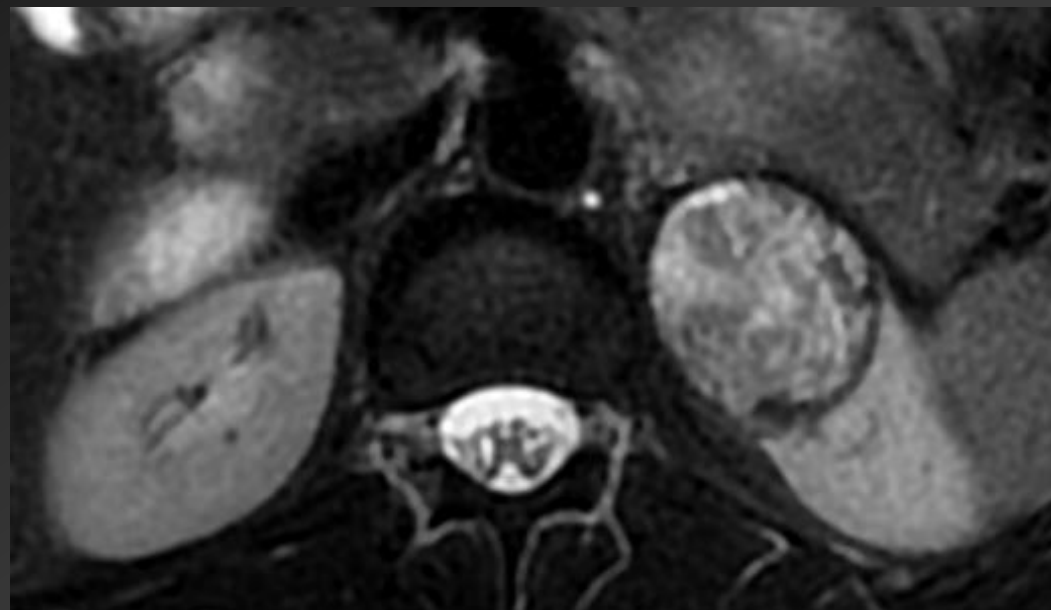
ADC map

Subtr: Se83% Sp89% - DW: Se71% Sp91% - Subtr+DW: Se87% Sp92% - ➤ Confiance diag.

T1 hyperintense renal lesions: characterization with diffusion-W MRI vs contrast-enhanced MRI. Kim S et al. Radiology 2009

Hématurie + lombalgies récentes
Scanner une phase
Diag: kyste dense
Votre avis et attitude ?





Precision

T

Precision

T

MI
0.08
6C1
h3.1
10 fps
G:77
DR:60

5

10

AP0.45%

MI
0.10
6C1
4.0
10 fps
G:79
DR:60

5

10

AP0.19%

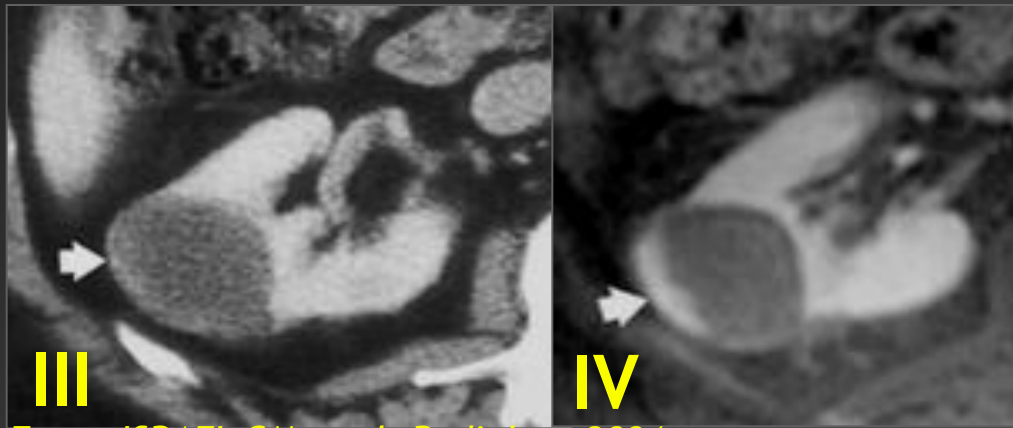
■ Lésions de type III en surveillance active

Espérance de vie réduite

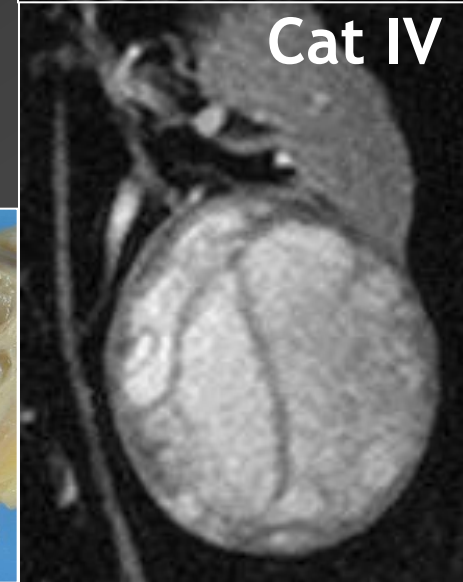
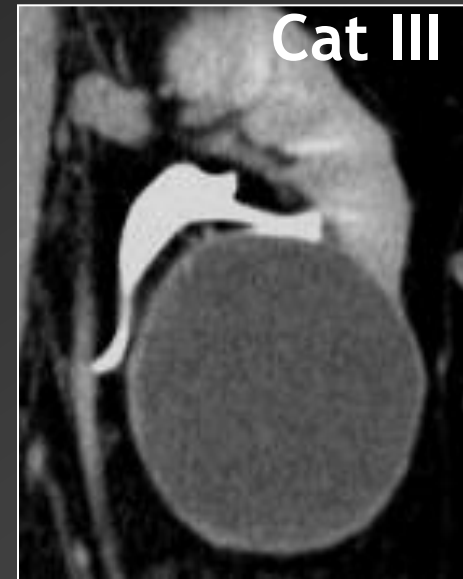
Risque néphronique et comorbidités

➔ Surveillance IRM

Meilleure confiance diagnostique
± reclassement en IV susceptible
de modifier la prise en charge



From: ISRAEL GM et al. Radiology 2004



Classification de Bosniak

Mode d'emploi

O Hélénon, S Merran et coll

- Je m'assure que la lésion entre dans le champ
- Je m'assure d'une technique CT adéquate
- Je maîtrise mes outils d'analyse (Bosniak)
- Je surveille les IIF après confirmation IRM
- J'utilise l'écho et l'IRM lorsque tous les critères ne sont pas réunis (lésions indéterminées)
 - ➡ *Echographie ciblée ± microbulles*
 - ➡ *IRM T1, T2, Diff., Gd dynamique fatsat*

- **Les masses kystiques inclassables et mal classées (par CT)**

Indications de l'écho ciblée et de l'IRM

- **Microlésion infraCM (terrain à risque)**
- **Variation D indéterminée (Δ 10-20UH)**
- **Densité spontanée indéterminée (20-50UH)**
- **Paroi épaisse + rehaussement négatif**
- **Masse de type IIF (sousclassées)**
- **Masses de type III (sousclassées) si surv. active**